3.0 State of the Bay—Human Use

This chapter describes human use of the Bay ecosystem by offering a brief overview of the Bay's history, regional setting, current patterns of use, future patterns and plans, and the economies that have developed on its waters and shores.

Photo 3-1. San Diego Bay Pier With Downtown in Background.

A, B, C—South Bay 1928

D and E—Sweetwater River Mouth and Marsh 1928

F—Portion of Newly Dedicated Lindbergh Field 1928.

G—Near Shelter Island 1928.

Photo 3-2. Aerial Photos of San Diego Bay 1928.

3.1 Ecological History of Human Use

3.1.1 Summary of Human Use and Change

A detailed summary of the major human events shaping the present condition of the Bay can be found in Appendix G "Ecological History of San Diego Bay." For a specific water pollution history, see Section 2.3.1 Water and Sediment Quality.

The earliest that man has been documented in San Diego County is 9,030 years ago (Warren 1967). Native Americans in settlements around San Diego established villages as well as fishing campsites. They hunted for game, collected shellfish, and gathered acorns, seeds, and nuts. "Fish constitutes the principal food of the Indians who inhabit the shore of this port, and they consume much shellfish because of the greater ease they have in procuring them" (Captain Vicente Vila 1769, cited in Pourade 1960).

On September 28, 1542, Juan Cabrillo found the natural, narrow channel opening to an embayment where seven river systems and tidal influence created a shore lined with deltas, mudflats, and salt marshes. Remaining for six days, the Spaniard reported a few native tribes who hunted and fished the sea with nets. He named the Bay San Miguel. Sixty years later, a Spanish-Mexican merchant, Sebastian Vizcaino, followed Cabrillo's route, found the embayment and renamed it San Diego Bay. To obtain fresh water, wells were dug on North Island.

- The whaling industry peaked in 1871–1872, when 55,000 gallons of oil and 200 tons of whalebone were shipped from Point Loma.

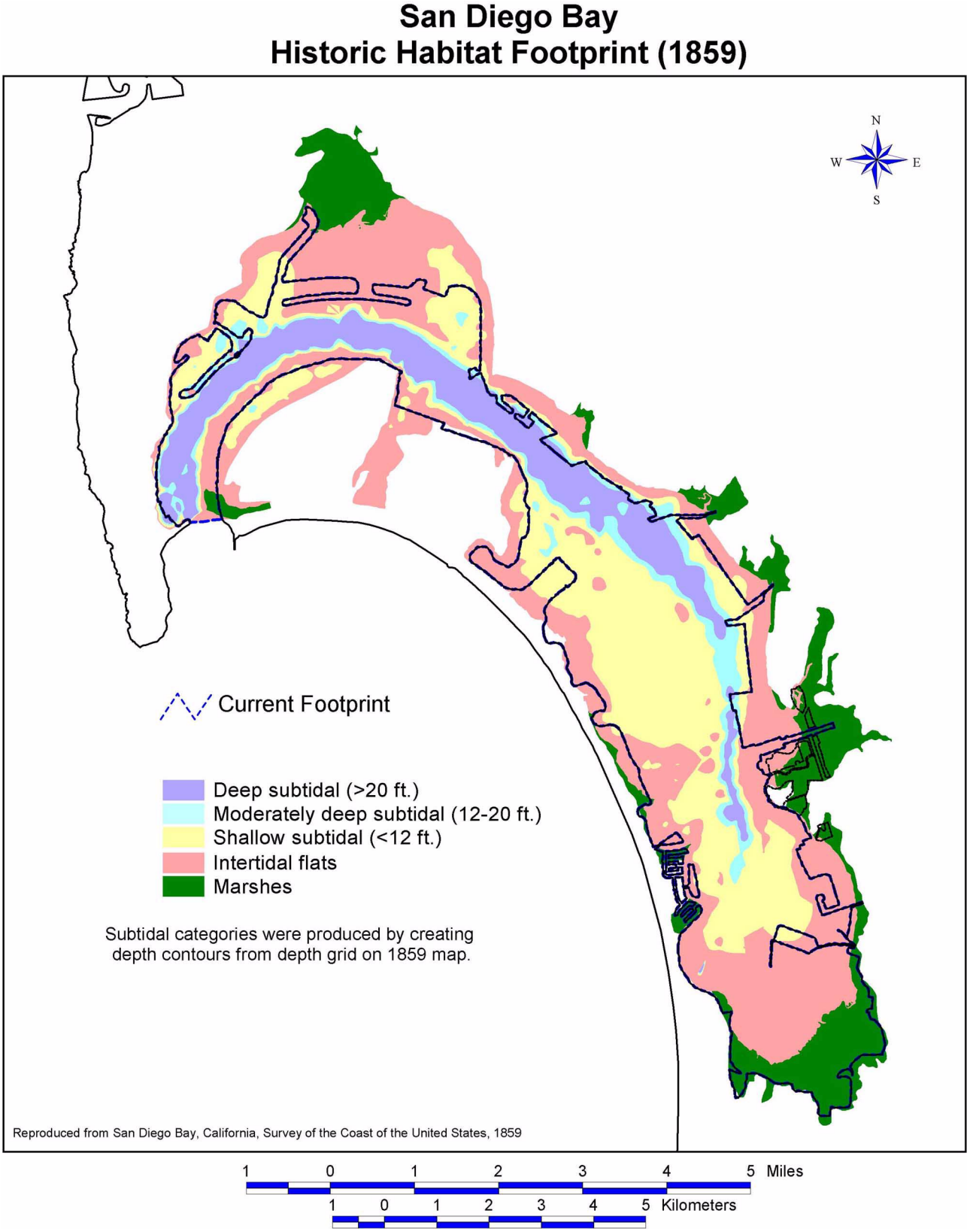
Establishment of the San Diego de Alcala Mission in 1769 brought a new era of occupation and use of the Bay as an active harbor for the Spanish fleet. Early Californio ranchers traded cattle hides and tallow that were shipped from the Bay. By 1830, there were sixteen American whaling vessels operating out of the Bay in search of the California gray whale. Commercial whale oil production began in the state in 1870. Between 1871–1872 the whaling industry peaked when 55,000 gallons of oil and 200 tons of whalebone were shipped from Point Loma (Fairey *et al.* 1996).

Over geologic time the waters of the San Diego River alternated between Mission (False) Bay and San Diego Bay. After settling for several hundred years on the delta of San Diego Bay, the river was permanently diverted into Mission Bay in 1853–1854 (see Map 3-1 for Bay habitat circa 1859).

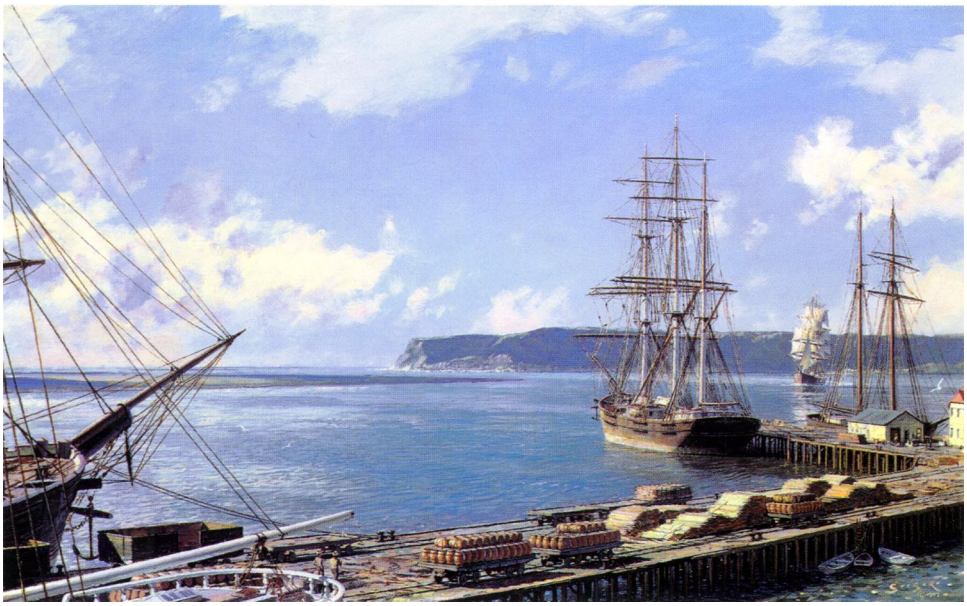
- With the land boom of the 1880s, water quality began to decline as raw waste was dumped directly into the Bay.

In the late 1880s, the community of San Diego was experiencing growing pains. Building of the Point Loma lighthouse and completion of the transcontinental railroad connection to San Diego in 1885 made the region more accessible, stimulating trade. San Diego also became a winter resort destination. In 1887, a new San Diego City sewage disposal system dumped raw waste directly into the Bay. In 1888, Cuyamaca dam was built with a flume that diverted water into Chollas Creek. Also in that year the first dredging in Glorietta Bay occurred using a steam suction dredge. Coinciding with the construction of Hotel del Coronado, the City of Coronado added a sewage system dumping into the Bay in 1890, as did National City in 1893.

Problems relating to a fast growing community continued to mount. In an effort to keep up with accumulations of garbage, disposal at sea near Point Loma using a garbage scow began. Dixon Crematory was built in 1897 near the foot of 8th Avenue to burn trash, and the scows were discontinued. By 1901, the human population numbered 30,000. Charting by the USCG still indicated relatively undisturbed tidal flats and salt marshes.



Map 3-1. San Diego Bay Historic Habitat Footprint (1859), with Current Shoreline Overlay.



© John Stobbart

Figure 3-1. Historic Painting of San Diego Bay by John Stobbart.

The natural sloping conditions of the south Bay were ideal for constructing dikes to form evaporation ponds for salt production in 1902. The ponds replaced natural areas of salt marsh and mudflats.

In 1919, the San Diego Chamber of Commerce purchased tidelands (mudflats and salt marsh) at the foot of 32nd Street ("Dutch Flats") for the Navy to dump dredge spoils from extending deep-water areas. The Bay was being reshaped to accommodate larger vessels and fill a demand for waterfront development. "Dutch Flats" was converted to a municipal airport in 1928. Shelter Island was created from dredge spoil on mudflats in 1934. In 1941, dredging deposits were used to fill in Spanish Bight on North Island, increasing the island by 620 acres (251 ha).

Photo © 1936 US Navy.

Photo 3-3. North Island 1936.

The cumulative effect of dredging and filling the Bay has caused the general effect of deepening the harbor and reducing its area. Comparing the current footprint to the 1859 condition of Map 3-1, dredge and fill has reclaimed much of the marsh land, tidal flats, and shallow habitats of the Bay (see Table 2-1). A more complete history of dredge and fill is described in Chapter 2.

- There was an influx of Navy and civilian personnel to the San Diego area during both WWI and WWII as ship building and airline construction reached new heights.

By 1942, the population was reaching 250,000, coinciding with a buildup of Navy and defense industry personnel, as ship building and airline construction reached new heights. The overloaded sewage system failed. Raw or minimally treated sewage was being dumped from fifteen outfalls into the Bay.

After the Korean War, the Bay was receiving 50,000,000 gallons of sewage and industrial waste per day, supporting a population of 400,000 people. There were five tuna canneries and a rendering plant discharging waste into San Diego Bay. Between 1951 and 1958, 7 ft (2 m) of sludge could be found at the City of San Diego sewage outfall.

- San Diegans can take great pride in initiating a Bay cleanup that preceded both the state and federal Clean Water Acts, perhaps the first bayside community in the nation to do so.

San Diegans can take great pride in initiating a Bay cleanup that preceded both the state and federal Clean Water Acts (CWA), perhaps the first bayside community in the nation to do so. In the 1960s, a new San Diego Metropolitan Sewage System with ocean outfalls went into operation and all domestic sewage was diverted to the new system. Voters passed a bond issue to construct the Tenth Avenue Marine Terminal (TAMT). Large-scale dredging and filling for National City and Chula Vista bayfronts and Harbor Island were initiated. Coronado Cays was constructed over a previous city burn dump site, adjacent to mudflats and salt marsh in 1968. The SDUPD funded an access channel and L-shaped boat basin in South Bay. The SDG&E power generating plant also became operational in the south Bay.

- The overloaded sewage system failed. In the 1960s, a new San Diego Metropolitan Sewage System with ocean outfall went into operation and all domestic sewage was diverted to the new system.

The 1970s and 1980s signified a time of cleanup for San Diego Bay. Navy and industrial firms made efforts to prevent and clean up oil spills. One cannery remains and it uses a purification system. Today, San Diego Bay supports abundant and diverse marine life. It is an agricultural trade center, a manufacturing trade center, a transportation hub, a base for sports fishing fleets, a base for Navy operations, a first port of call, and a center of tourism and recreation.

3.2 The Bay Region's Human Setting

3.2.1 Area and Population

San Diego Bay itself is 14.7 mi (23 km) long and covers over 19 mi^2 (49 km^2) of water and land. The Bay region includes the cities of San Diego, Coronado, National City, Chula Vista, and Imperial Beach. The San Diego Metropolitan Area ranks as the 7th largest in the country. In 1990, the population census for these five cities was 1,353,013. By 1996, the population estimate was 1,447,351, an increase of 7% (San Diego Association of Governments 1997a). While this growth rate was slower than that of the 1980s, the population increase still creates pressures for additional housing and jobs in an already densely populated region. Tourists swell the population year-round due to the numerous attractions of the area, with over 35 million annual visitors (US Fish and Wildlife Service 1998).

3.2.2 Land Use and Ownership

Urban uses dominate the San Diego Bay region and shoreline, with the exception of the south Bay. Industrial uses along the Bay and its environs include shipyards, docks and wharves, shipping and trade companies, aerospace and airport industries, and manufacturing. Commercial businesses are represented by retail stores, hotels, conference centers, cruise ships, restaurants, marinas, office buildings, and salt ponds. Only a few residential areas immediately abut the Bay tidelands, with more condominiums, apartment houses, and homes located not far from the shoreline. Naval facilities in the Bay area are composed of all three types of urban land uses (industrial, commercial, and residential) in addition to open space (see Map 3-2).

- See Map 3-2 San Diego Bay Regional Land Use.

Public facilities along the Bay include municipal buildings, community centers, public piers and boat launching ramps, local and state parks, bike trails, promenades, beaches, and other recreational sites. These areas provide the primary public access to the Bay. However, not all of the Bay is improved for intensive human use. Areas of designated and de facto open space, vacant lots, road rights-of-way, and environmental protection sites cover the remaining portions of the Bay, often in scattered parcels surrounded by developed sites. The largest, contiguous area of undeveloped tidelands is in the south Bay.

3.2.2.1 Bay Water and Tidelands

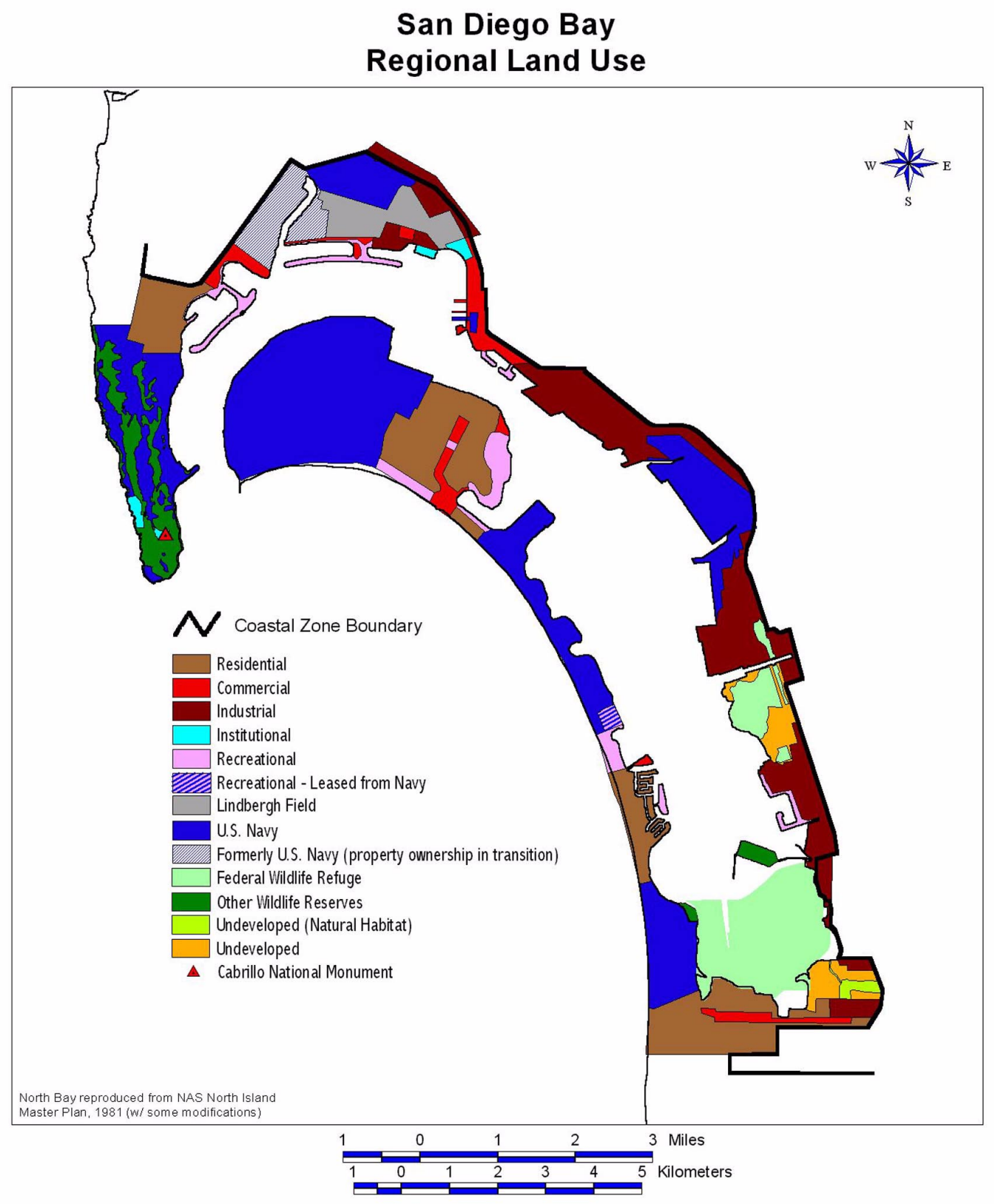
Tidelands in San Diego Bay encompass all of the land and water bayward of the historic (1850) mean high tide line. This is a mix of historic tidelands that still exist, formerly submerged areas that have been filled, and diked ponds.

Historic tideland areas are owned and controlled by the US Government (Navy and US Fish and Wildlife National Wildlife Refuge), the state of California, the SDUPD, the County of San Diego, and the cities of San Diego and Coronado, as shown in Table 3-1 (San Diego Unified Port District 1980). The federal and state acreages in this table have not been revised for the land and water acres transferred to the National Wildlife Refuge (NWR) in 1999. The closure and privatization of the NTC property in 1999 is included in Table 3-1. Subsequently, a USFWS conservation easement on 25 acres of former NTC property that had been used as a least tern nesting site was removed, as part of an agreement between the Port and USFWS that resulted in establishment of the South San Diego Bay NWR.

Table 3-1. San Diego Bay Tidelands by Ownership (uncorrected for approximately 1490 acres of land and water transferred from private and state holdings to USFWS, 1999).[1]

Owner	LAND acres	hectares	%	WATER acres	hectares	%	TOTAL acres	hectares	%
Federal (Navy)	1,421	575	32.1	1,215	492	10.8	2,636	1,067	16.8
Federal (USFWS)	52	21	1.2	0	0	0.0	52	21	0.3
State of California	3	1	<.1	6,703	2,713	59.7	6,706	2,714	42.8
San Diego Unified Port District	2,284	924	51.5	3,306	1,338	29.4	5,590	2,262	35.7
County and City	672	272	15.2	0	0	0.0	672	272	4.3
Totals	4,432	1,793	–	11,225	4,542	–	15,656	6,336	–

1. Source: San Diego Unified Port District, 1980 Master Plan, as revised from 1984 transfer of Port to state and 1999 transfer of NTC property to Port and City of San Diego; Geographic Information System coverages.



Map 3-2. San Diego Bay Regional Land Use.

The Navy holds deeds to about 1/5 of the total tideland area and about 1/3 of the total shoreline. In 1962, the state legislature granted sovereign land in trust to the Port for the purpose of operating and maintaining port facilities for statewide benefit. About 1/3 of the total tidelands and almost 2/3 of the Bay's shoreline were granted to the Port by the state. Over half of the filled tidelands are under Port jurisdiction. The state, under the SLC, retained ownership of the majority of submerged lands under the Bay, including the navigation channels.

The SLC leased most of the salt pond area in South Bay to Western Salt Company before the formation of the Port. In 1984, the Port's 612 acre (248 ha) lease of water and salt ponds reverted to state control. In 1999, this lease was granted to the USFWS. Other state tidelands are owned by the CDPR (Silver Strand State Beach) and the Bridge Authority (Coronado Bridge right-of-way).

The US Navy obtained title to tidelands when it began operating shipyards and other installations in the Bay. Much of North Island and the NAB are filled tidelands. In addition to using tidelands that it owns, the Navy leases land and water from the Port for the NAVSTA. Included in the federal acreage figures above are the US Coast Guard Station and the US Marine Corps Recruit Depot.

The cities of San Diego and Coronado and the County control 34 acres (14 ha) of filled tideland, upon which are located municipal buildings, parks, and a boat launch. A 20 acre (8 ha) private parcel of fallow agricultural land that may be filled tideland was recently purchased by the City of San Diego near the Otay River (US Fish and Wildlife Service 1998).

3.3 Current Patterns of Use

As an overview of the natural resources across all ownerships in the Bay, this Plan goes beyond the current plans for separate jurisdictions. Its broader view provides for better identification of data gaps, more complete synthesis of resource information, and a bigger picture for strategy. With these improvements, the Bay INRMP offers a useful framework upon which other plans can reference, build upon, or adopt as their own. Planning jurisdictions for the cities, Port, and federal government in the San Diego Bay region are indicated in Map 3-3.

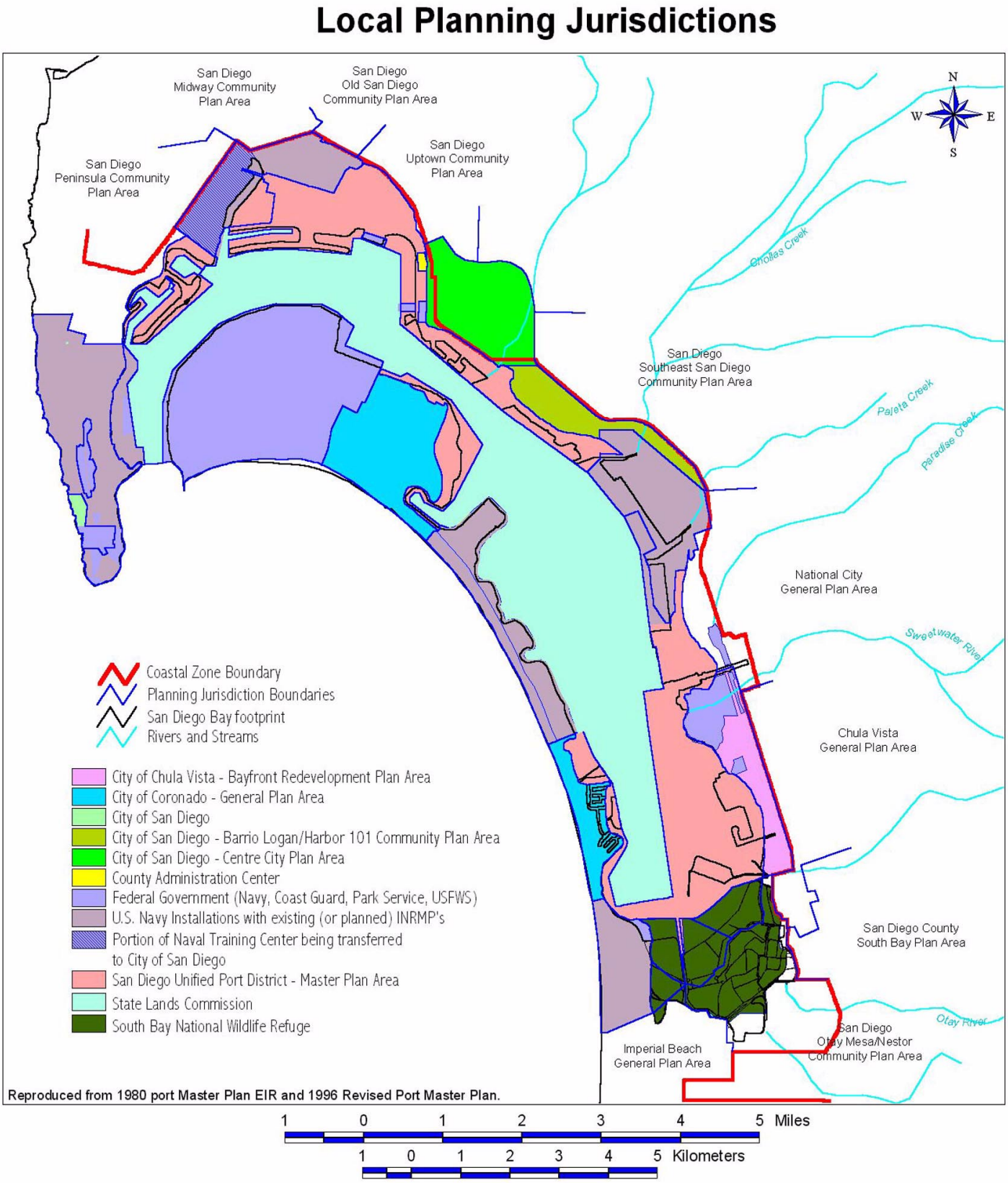
3.3.1 Navy Plans and Uses

In the San Diego Bay Navy complex, there are three primary property managers, with regional command provided by the Commander, Naval Region Southwest.

1. The NASNI complex includes:
    - Air Station,
    - Naval Amphibious Base,
    - Naval Radio Receiving Facility,
    - Imperial Beach Outlying Landing Field,
    - Naval Auxiliary Landing Field, San Clemente Island, and their current tenants.

NAB includes a 40 acre (16 ha) parcel leased by the Navy to the CDPR for public use.

2. The Point Loma Complex includes:
    - Space and Naval Warfare Command,
    - Anti-Submarine Warfare (ASW) Base,



Map 3-3. Local Planning Jurisdictions of San Diego Bay Environs.

- Submarine Base, and
- Fleet Combat Training Center.

3. The Naval Station Complex includes:
   - 32nd Street facility and
   - Naval Medical Center in Balboa Park.

The Marine Corps Recruit Depot reports directly to Headquarters Marine Corps.

Photo 3-4. US Navy Cruiser and Destroyer.

The US Department of the Navy is required to implement and maintain a balanced program for the management of natural resources (US Department of the Navy 1994). For each Naval installation, an INRMP must be prepared, based on criteria described within the Navy's Environmental Protection and Natural Resources Manual (OPNAVINST 5090. 1B). Table 3-2 lists all of the current natural resource management plans (NRMPs) and date of completion for the Bay's Naval installations.

Table 3-2. Natural Resource Management Plans and Approval Dates for the San Diego Bay Area.

Plan	Approval Date
Marine Corps Recruit Depot INRMP	1998
Naval Station NRMP	1996
Fleet Anti-Submarine Warfare Training Center INRMP	1996
Point Loma NRMP	1994
Naval Training Station NRMP	1990
Magnetic Silencing Facility NRMP	1989
Naval Radio Receiving Station, Imperial Beach NRMP	1989
Naval Ocean System Center, Point Loma NRMP	1989
Fleet Combat Training Center NRMP	1989
Naval Submarine Base, Point Loma NRMP	1989
Naval Amphibious Base, Coronado NRMP	1989
Naval Supply Center, Point Loma Annex NRMP	1988

- Integrated Natural Resource Management Plans are completed for each of the Bay's Naval installations. The Point Loma NRMP also included several other federal properties and broke cooperative ground for this joint planning effort.

In 1994, a unique regional effort produced a joint Point Loma NRMP for the Point Loma Naval Complex, the Cabrillo National Monument, Fort Rosecrans National Cemetery, and the USCG, Point Loma. Experience from this cooperative planning effort, which focused on the protection of sensitive biological resources, was a stepping stone to the concept of the present joint Navy-Port INRMP for San Diego Bay.

Additionally, the Navy prepares master plans for each installation that address facility planning for structures, infrastructure, and landscaping. The roles of the various Navy activities, their operational use of San Diego Bay, and related operational and maintenance refinements are shown in Table 3-3.

Table 3-3. US Navy, US Coast Guard, and US Marine Corps Uses of San Diego Bay by Organization.

Organization and Mission	Operations and Activities	Operational Requirements Related to San Diego Bay
Fleet and Industrial Supply Center (FISC): Provide Naval Forces quality supplies and services.	■ FISC includes two sites on SD Bay: FISC Broadway at 937 N. Harbor Drive, which includes a large berthing pier, and FISC Fuel Depot at 199 Rosecrans on Point Loma. ■ Ship Berthing (bimonthly). ■ Refueling: daily (2 ships/day). ■ Fuel Transfer (every other day from Fuel Depot to Miramar; bimonthly from Fuel Depot to NASNI).	Boat ramp, shore access, anchorage, piers support. Water depth at Point Loma Pier must be maintained at approximately 45 ft (15 m) for vessel refueling. Pile driving (pier repair), dredging/filling (pier maintenance). Berth at fuel depot requires a minimum 45 ft (15 m) depth for vessels. Pile driving and dredging/filling also occasionally occurs at the fuel depot for maintenance.
Space and Naval Warfare Command (SPAWAR), formerly Naval Command Control Ocean Surveillance Center, and Navy Research and Development (NRAD): Research, Development, Testing, and Evaluation.	■ Research, Development, Testing and Evaluation. ■ Scuba/swimmers under piers (daily). ■ Whalers/inflatables in main shipping channel (daily). ■ Marine mammals (dolphins, porpoises, etc.) in submerged animal pens for underwater ordnance recovery and anti-swimmer security. ■ Underwater remotely operated vehicles, and various underwater equipment and tools. ■ Cable-laying under SD Bay.	Shore access, boat ramp, maintenance of NRAD pier, water depth in main shipping channel. Pier maintenance.
Naval Submarine Base: Provide logistic support to subsurface and surface units.	■ Camel Moves (daily). ■ Life Guard Duties (daily). ■ Boom Handling (daily). ■ Oil Recovery (as needed). ■ Harbor Transit (daily). ■ Security Patrol (daily). ■ Diving, hull inspection/maintenance (daily). ■ Some recreational fishing from piers and ships by sailors.	Shore access, pier support and maintenance, boat ramp, primary road, electricity support, main shipping channel maintenance, restriction of recreational boating activity during special operations, dredging/filling, pile driving, pile replacement.
Naval Radio Receiving Facility: Provide rapid relay and secure communications for defense of US and its allies.	■ Security force roving patrol. Area is fenced for security. ■ Recreational camping and fishing occur on the property.	Site-specific unobscured antenna array in an electromagnetically quiet area isolated from man-made noise.
Naval Station, 32nd Street: Provide berthing dock for Naval ships.	■ Flight Ops—occasional (5/yr). ■ Diving—daily, hull inspection/maintenance; SEAL Ops. ■ Ammunition movement/transfer (1 or 2 every two weeks or so). ■ Oil spill response. ■ Small boat (rubber zodiacs and motor whale boats) activities (daily). ■ Helicopter flight operations on import ships, usually Amphibious Assault Ships (general purpose) (LHAs) or Amphibious Assault Ships (multi-purpose) LHDs (occasional, about 5 times a year). ■ Recreational fishing occurs occasionally off of the piers or ships by sailors. There is a NAVSTA to NAB recreational swim held once a year.	Shore access, pier support, SD Channel maintenance, water depth 37 ft (11 m) from Coronado Bridge to Pier 14, pier maintenance, dredging/filling.

Table 3-3. US Navy, US Coast Guard, and US Marine Corps Uses of San Diego Bay by Organization. (Continued)

Organization and Mission	Operations and Activities	Operational Requirements Related to San Diego Bay
Magnetic Silencing Facility: Test and treat ships to minimize risk.	■ Testing and treating of ships to reduce magnetic signatures and thereby minimize the risk of setting off magnetic influence mines (periodic). ■ Deperming and degaussing (several times per year).	The facility has a 1,650 ft (503 m) radius electromagnetic interference zone around the facility that restricts development on adjacent SUBASE and FISC property.
Fleet Anti-Submarine Warfare Training Center: Provide tactical and technical training in a safe and stimulating environment to provide skilled anti-submarine warfare professional capable of supporting the requirements of higher authority.	■ Warfare training. ■ Security patrol.	Pier maintenance.
Marine Corps Recruit Depot: Provide training to recruits**.**	■ Recruit training. ■ Recreational fishing from the piers.	Boat ramp and marina (recreational), pier maintenance.
Naval Air Station North Island: Arm, repair, provision, service, and support the US Pacific Fleet and other operating forces.	■ Ordnance movement/transfer/supply (daily). ■ Nuclear carrier berthing (daily). ■ Pacific Naval Air Unit training. ■ Helicopter Tactical Wing training. ■ Anti-Submarine Wing training. ■ Weapons training. ■ Supply and support services. ■ Repair and manufacturing services ■ Technical support services.	Shore access, anchorage, pier support, boat ramp, and maintenance.
Naval Amphibious Base: Provide on-base facilities and services in support of amphibious, unconventional, inshore; and riverine warfare; special warfare; and other approved training related to amphibious activities.	■ Physical conditioning. ■ Obstacle course. ■ Amphibious assaults. ■ Covert shore assaults. ■ Navigation and surf handling. ■ Combat training. ■ Ship surveillance. ■ Scuba diving. ■ Swimmer delivery vehicles and special boats. ■ Strategic sealift. ■ Container off-loading and transfer system. ■ Offshore bulk fuel system. ■ Off-shore petroleum transfer. ■ Explosive ordnance disposal. ■ Mine counter measures. ■ Conseil Internationale Du Sport Militaire.	Shore access, pier support, boat ramp, helicopter pad, anchorage, restricted waters for underwater and surface uses.
US Coast Guard: Provide services for southern California maritime law enforcement, search and rescue, oil spill and hazardous materials response, and some permitting.	■ There is a small facility on Point Loma immediately adjacent to the SUBASE and the NAVSTA degaussing facility. This is the mooring location for the US Coast Guard Cutter Tybee. ■ There is an 8 acre (3 ha) facility at the south tip of Point Loma with a lighthouse and housing for three senior officers. ■ Search and Rescue. ■ Oil/hazardous materials response. ■ Law enforcement. ■ Aircraft sorties (36 per month). ■ Patrol boat deployment (60 per month). ■ Permitting marine events and impacts to navigable waters.	Airfield access, shore access, helipad/drop-zone, pier support. Patrol boat deployment minimum water depth 20 ft (6 m).

3.3.2 Port Plans and Uses

The Port Master Plan was adopted in 1980, although many amendments have been approved over the years. The Plan serves as guidance for policy decisions by the Board of Port Commissioners. The Port Master Plan also serves as the basis for capital improvements programming and services for use by the staff, and as a source of information and opportunities by agencies, the public, and private investors (San Diego Unified Port District 1996).

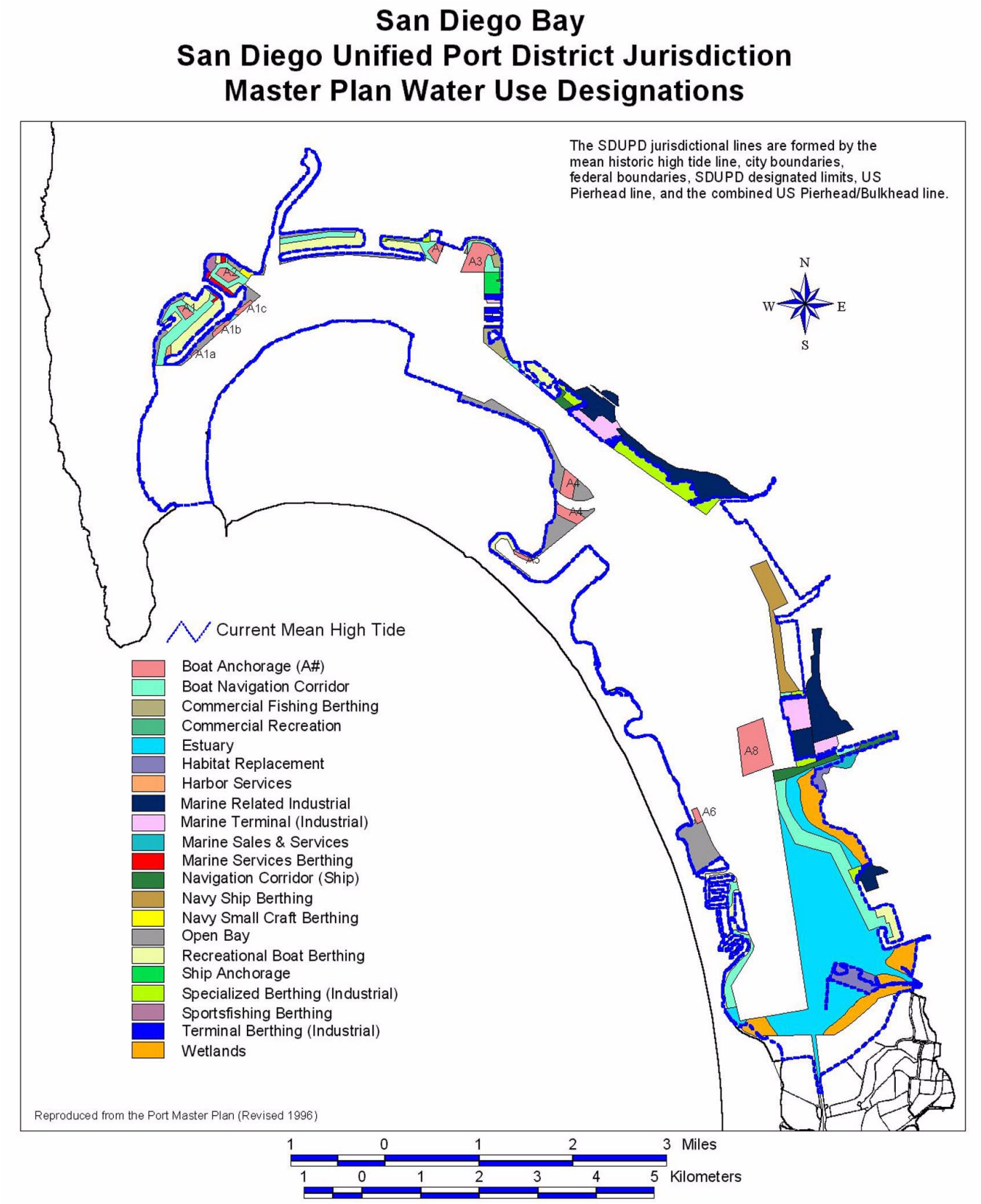
Photo © 1999 SDUPD.

Photo 3-5. San Diego Bay.

Water use designations within the Port's jurisdiction are shown in Map 3-4 with definitions of uses in Table 3-4. These categories determine which uses of the Bay's water are allowable and not allowable. When the anchored vessel fleet increased to a size that caused many problems, the Port amended its 1980 Master Plan to repeal the identification of all of San Diego Bay as an anchorage ground and instead designated eight small craft long-term mooring and anchorage areas (WESTEC Services 1984). These areas are noted on the map, with A-8 being designated as free anchorage. Derelict boats are gradually being removed by the Port throughout the Bay. Emory Cove anchorage was cleaned up to protect the area's environment. An estimated 885 boats with 1,272 people living aboard can be found in the Bay (San Diego Unified Port District 1995a).

- This INRMP can be used as guidance for the Port's Master Plan revision. Relevant strategies from the Port's Five Year Action Plan for a Clean San Diego Bay are also included and expanded upon in this Plan.

Updates and amendments continue to be made to the original Plan's 10 planning subareas: (1) Shelter Island, (2) Harbor Island/Lindbergh Field, (3) Center City/Embarcadero, (4) Tenth Avenue Marine Terminal, (5) National City Bayfront, (6) Coronado Bayfront, (7) Chula Vista Bayfront, (8) Silver Strand South, (9) South Bay Salt Lands, and (10) Imperial Beach oceanfront. Subarea plans, such as for the South Embarcadero, have recently been debated and proposed (Sasaki 1996). As part of the planning process, the CCC must certify the Port Master Plan to be consistent with the policies of the CCA. CCC certification authorizes the Port to directly grant coastal development permits.



Map 3-4. San Diego Bay Port Jurisdiction Master Plan Water Use Designations.

Table 3-4. San Diego Bay Port Master Plan Water Use Mapping Definitions, as Seen in Map 3-4.

Water Use	Mapping Definition
Boat Anchorage (A1–A8)	Small craft anchored vessels that are not connected to land by any docks.
Boat Navigation Corridor	Areas delineated by navigational channel markers or by conventional waterborne traffic movements. Channels that are too narrow and/or shallow to accommodate larger ships.
Commercial Fishing Berthing	Areas leased for the berthing of commercial fishing vessels.
Commercial Recreation	Areas leased for commercial recreation (restaurants, boat tours, etc.).
Estuary	The confluence of the Otay and Sweetwater Rivers with the Bay; relatively warm, shallow, submerged areas where exchange occurs between salt and fresh water. The northerly extent of the estuary area had been altered by dredging that has reduced the exchange of waters.
Habitat Replacement	Conservation areas used to replace lost habitat.
Harbor Services	Harbor regulatory services and activities; including police, fire, and transient berthing facilities.
Main Ship Channel	Provides a depth between 35–42 ft (11–13 m) and widths varying from 600–2,000 ft (183–610 m) for the navigation of large oceangoing vessels.
Marine-Related Industry	Sites adjacent to water for industrial activity dependent for direct access or for linkages to waterborne products, processes, raw materials, or large volumes of water.
Marine Terminal	Container terminal requiring berthing space with water depth a minimum of 35 ft (11 m) at MLLW.
Marine Sales and Services	Areas adjacent to navigation corridors leased for marine sales and services.
Marine Services Berthing	Areas adjacent to navigation corridors leased for marine services.
Navy Ship Berthing	US Naval Station (leased Port land).
Navy Small Craft Berthing	US Navy Fleet School (leased Port land).
Open Bay	Portions that are free of development and where primary uses are recreational.
Recreational Boat Berthing	Areas leased for permanent and/or temporary berthing of private vessels.
Ship Anchorage	Areas for oceangoing ships.
Ship Navigation Corridor	Adequate draft for ship maneuverability, safe transit, and access to marine terminals, marine-related industrial areas and Navy bases (ship corridors must be maintained at adequate widths and depths to eliminate hazardous conditions in the harbor).
Specialized Berthing	Areas leased for marine-related industrial businesses (steel fabrication, ship building and repair, fuel receipt and storage, and marine-related food processing etc.).
Sport Fishing Berthing	Areas leased for private businesses chartering to the public.
Terminal Berthing	Berthing for commercial vessels loading and unloading cargo (general trade, petroleum products, fish and molasses, etc.).
US Navy Jurisdiction	Areas controlled by the US Navy (some uses include training activities, ship berthing, open bay uses, etc.).
US Navy Property	Uses vary by each individual piece of property (some uses include training with amphibious vehicles, ship berthing and repair, etc.).
Wetlands	Undeveloped areas having high biological productivity that are alternately covered with water and exposed to air.

In 1995, the Port approved a "Five Year Action Plan for a Clean San Diego Bay" as an update to its 1992 action plan. This plan's purpose is to protect and restore the biological health and diversity of San Diego Bay as well as its surrounding ecosystems. To achieve this goal, the Port has taken proactive measures to protect Bay water quality, marine sediments, marine life, and wetlands in balance with regional economic demands. Environmental education programs, clean boating campaigns, sediment remediation efforts, and storm drain monitoring are some of the projects implemented to date. Relevant strategies from the Five Year Action Plan are included and expanded upon in this Bay Ecosystem Plan.

3.3.3 Local Plans

Since the cities' boundaries overlap the Port's tideland ownership, the planning jurisdictions appear to overlap also in Map 3-3. Each city plans its land use by preparing and adopting a state-required general plan, as well as a LCP for property within the coastal zone. The City of San Diego also adopts Community Plans to cover each community within its large boundaries. However, the Board of Port Commissioners makes the final decisions on land use designations for Port tidelands within the Port's Master Plan.

The CCC provides state oversight to LCPs, as required by the CCA. Once these plans become certified by the CCC, the cities can issue development permits.

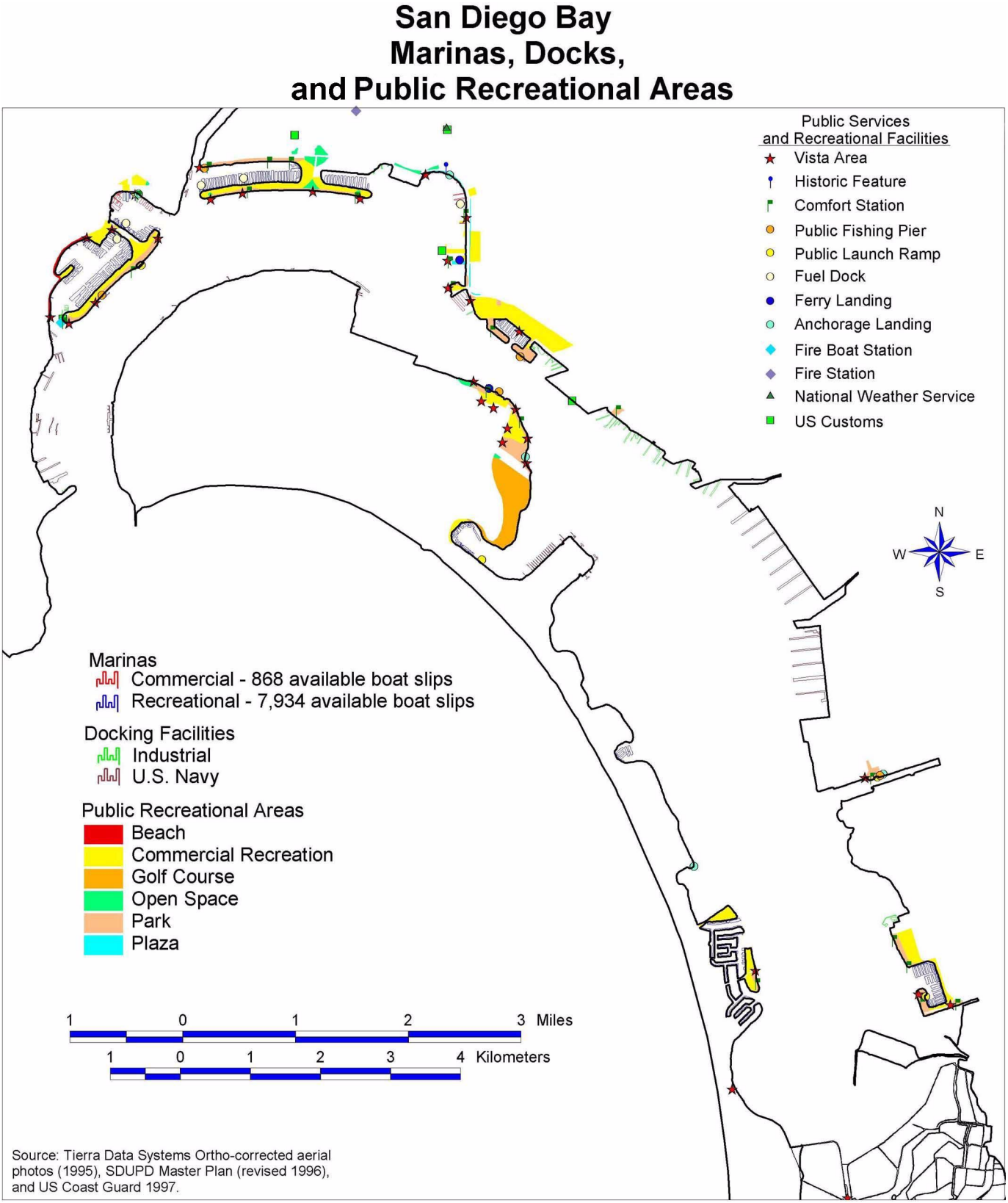
3.3.4 Recreation and Tourism Uses

The Bay is an internationally-recognized venue for competitive yachting. Other recreational uses of San Diego Bay (see Map 3-5) include boating of many types: sailing, motorboating, jetskiing, waterskiing, windsurfing, and kayaking. For the eighteen public marinas, four private yacht clubs, four free boat launch ramps, 55 boatyards, restaurant docks, and anchorages in existence within the Bay, a total of 8,281 boat slips are available, with over 80% occupancy (San Diego Unified Port District Harbor Police 1995b). Boating facilities are depicted in Map 3-5 while recreational traffic is shown in Map 3-6.Recreational boat berthing areas are found mainly at Shelter Island (Yacht Basin with 2,300 craft and ACH with 800 craft), Harbor Island, Embarcadero, Glorietta Bay, Coronado Cays, and Chula Vista (San Diego Unified Port District 1997b).

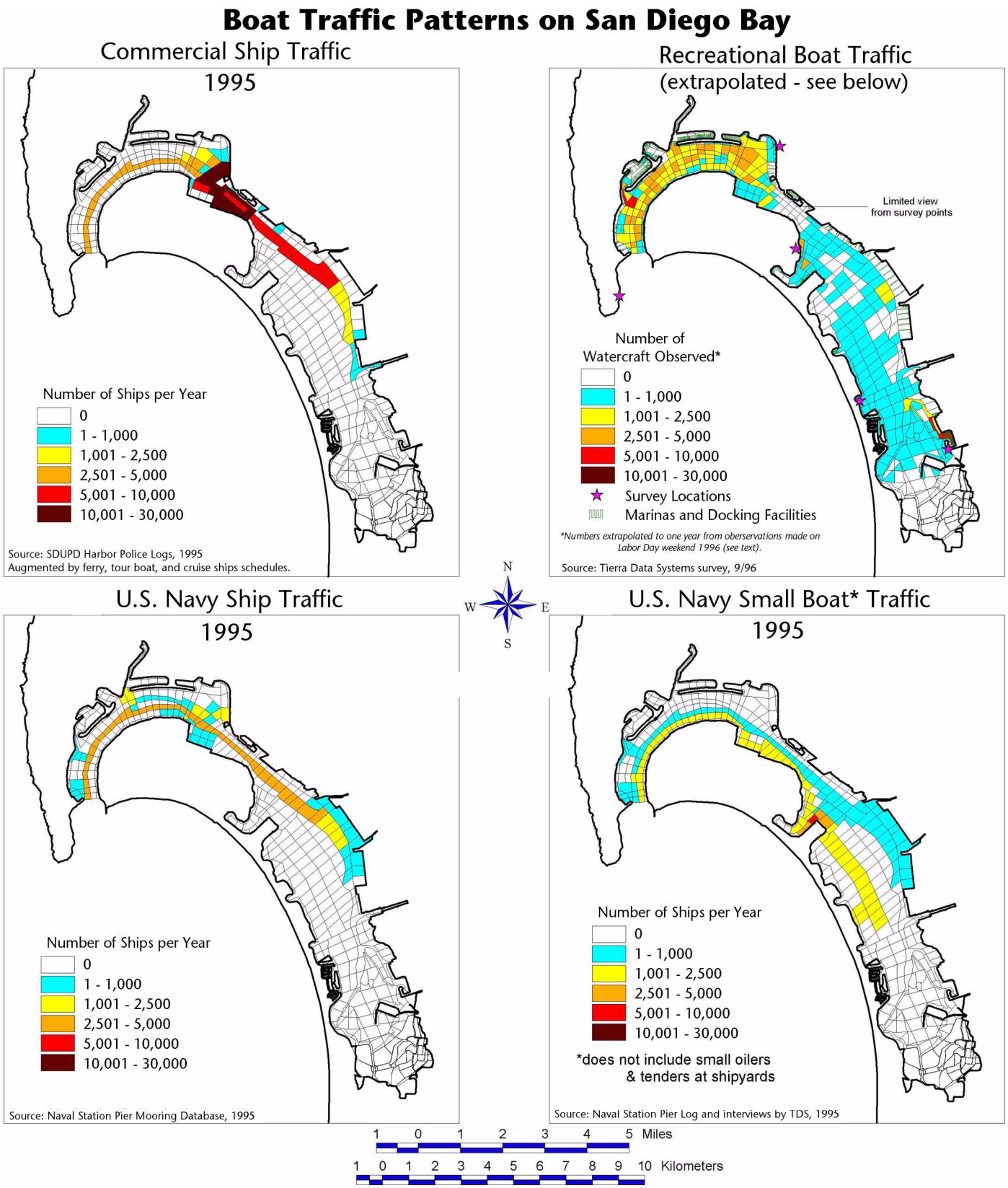
- Shoreline parks provide access to the Bay and outdoor activities including swimming.

Public parks along the shoreline that provide access for tourists and residents to the Bay and opportunities for many outdoor activities include: Shelter Island, Harbor Island, Spanish Landing Park, Tuna Harbor, Embarcadero Marina Parks North and South, Coronado Tidelands Park, Crosby Street Park, Bayside Park, Pepper Park, Chula Vista Bayfront, Marina View Park, and Silver Strand State Beach. A few beaches are available for swimming in the Bay: Coronado Park, Kellogg Beach, and the State Beach. Scuba diving in the Bay is only allowed with special permit.

Tourists visit the Bay and its waterfront areas to do a variety of activities, such as: boat tours, dining, sport fishing, shopping, summer concerts, biking, and sightseeing. Some visit the Bay as part of their free time while they are visiting on business, such as at the San Diego Convention Center. The Convention Center attracted about 300,000 delegates to its conventions and tradeshows in 1997. Cruise ships disembark at the B Street Pier to allow passengers time to roam the area. The Maritime Museum near this pier had 116,800 visitors in 1997. Promenades along the shoreline offer views while visitors walk, jog, or bike ride between sights. Special events on the Bay also attract tourists—America's Cup races, Tall Ship Festivals, and Navy Fleet Week, for example.



Map 3-5. San Diego Bay Marinas, Docks, and Public Recreational Areas.



Map 3-6. Boat Traffic Patterns on San Diego Bay (Refer to Table 3-5 for Detailed Explanations of this Map).

Table 3-5. Boat Traffic Patterns.

Assumptions and Limitations of Commercial Ship, US Navy and Recreational Boat Traffic Data (1995 data, summarized by Tierra Data Systems 1996).

Commercial Ship Traffic

These data are from the Port's ship logs for 1995, augmented with interviews and schedules from the following sources: cruise ships (were not operating in 1995), Bay tour boats, whale watching tours, and the Coronado ferry.

US Navy Ship Traffic—Port Services Office Data

The historical data maintained by Port Services consists of a monthly summary of ship movements by ship class. This information tracks all US Navy, US Coast Guard, US Naval Supply, other military (US Army), federal government, government contract, and foreign military vessels entering or leaving San Diego Bay. Private vessels, pleasure craft, or commercial vessels (unless under government contract) are not included in these logs. A movement is a transit into the Bay, out of the Bay, or between locations within the Bay. A ship class is a particular model of ship built for the Navy. Examples of ship classes are: Spruance-class destroyer, Tarawa-class amphibious assault ship, Kaiser-class fuel replenishment ship, or Hurricane-class coastal patrol boat. The data do not provide specific dates of ship movement, destination of ships, or whether a ship is entering or departing the Bay. The Navy records were augmented with schedules and interviews from ASW Training Center.

US Navy Small Boat Traffic

These data are based on interviews and logs from NAB, SPAWAR, and NAVSTA (the latter for barge traffic). They include:

1. All surface combatants, amphibious warfare ships, coastal patrol craft, and destroyer tenders transited from/to NAVSTA.
2. All aircraft carriers transited from/to NASNI.
3. All submarines, submarine tenders, and Coast Guard cutters transited from/to Point Loma.
4. All oilers, supply ships, sealift ships, ocean going tugs, research vessels, ocean surveillance ships, hydrographic survey ships, and foreign military ships transited from/to several locations, including NAVSTA, NASNI, FISC Supply Pier (near Broadway Pier), Broadway Pier, Point Loma Fuel Depot Pier, and Point Loma NRAD Pier.

Based on interviews of US Navy Port Services personnel, most of the above ship types berth at NAVSTA between 60 and 80% of the time, and berth at NASNI, FISC or Point Loma the remainder of the time. The data for these ship types were divided among these locations accordingly. It provides a fairly accurate summary of traffic patterns for these ship types, but the month-to-month data may vary substantially depending on ships actually berthed.

All ship movements were assumed to be a transit into/out of the Bay, even though other movements occasionally occur. Surface combatants and supply ships occasionally stop at NASNI B Pier for ammo transfers, and "deadstick" moves between two piers at NAVSTA, or between an installation and NAVSTA occur on occasion. The US Navy Port Services would count such a move as a "movement," and make no distinction between it and transit into/out of the Bay. It is difficult to say how much Navy traffic is of this type, but the number is small, probably around 3 to 5% of total movements.

Barge traffic was not included in the map. This traffic occurs daily. Almost all barge traffic is within the Bay, with NAVSTA as the predominant destination, but other Naval installations receive barges as well.

Recreational Boats

Use patterns for recreational boats were observed on Labor Day weekend, September 2 to 3, 1995 from five observation points around the Bay, noted in Map 3-6. Any one area of the Bay was observed for a single day of that weekend. The types of vessels observed included sail boats, yachts, kayaks, rafts, jet skis, power boats, windsurfers and zodiacs. Photographs were taken every 15 minutes at specific compass angles to cover the entire field of view. Some locations were obscured from the field of view, and so no boats were recorded there. To estimate annual use, the weekend totals were multiplied by 70, which was thought to conservatively approximate annual activity, considering Labor Day is a busy weekend, and weekends in general are busier than week days (based on interviews with Harbor Police). The data were also extrapolated spatially into the same grid cells used for other Bay research projects (see Section 2.5.5 "Birds") for an explanation of the grid cells used). Comparisons to SDUPD data (1997) suggest that these values for recreational boat traffic may be underestimates.

■ Birdwatching is attracting tourists to the Bay because of the diversity of migratory and resident birds.

Hundreds of thousands of visitors come to San Diego County each year to watch wildlife, primarily birds (US Fish and Wildlife Service 1998). With the Bay's great diversity of migratory and resident birds, birdwatching is becoming a new focal point for attracting tourists. An International Migratory Bird Day Event was sponsored in 1997 by the City of San Diego Park and Recreation Department and several wildlife organizations. The Imperial Beach Bird Fest was successfully inaugurated as an annual event in 1996. Publicity about the Chula Vista Nature Center is bringing in greater numbers of tourists to its museum and the SMNWR. An average of 41,000 people have visited the Nature Center each year since 1995.

3.3.5 Navigation

Navigation patterns in the Bay are governed by the presence of artificially constructed, 10 to 60 ft (3 to 18 m) deep channels that allow passage of vessels of various sizes, as well as the presence of certain in-water restricted areas. These are shown in Map 3-7 San Diego Unified Port District 1996a). Also, recreational uses depend upon the availability of marinas plus the patterns of wind and calm and how each sport uses these factors to advantage. Boat traffic patterns on the Bay are shown in Map 3-6, with assumptions behind some of these figures presented in Table 3-5. The Port reports 724 commercial vessel arrivals in Fiscal Year 96–97 (203 cargo, 42 cruise/passenger, 23 barges, and 456 other) (San Diego Unified Port District 1997b).

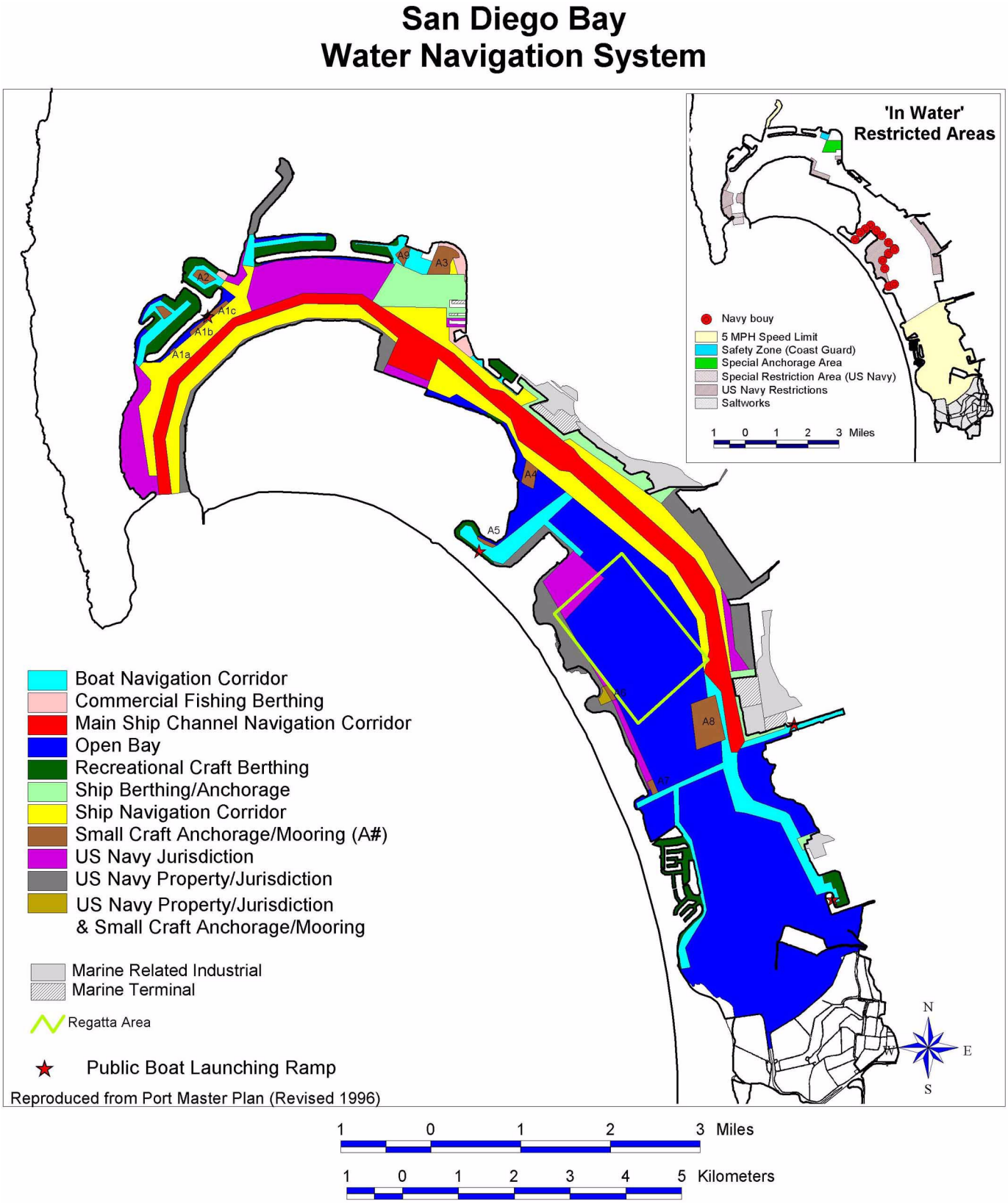
■ San Diego Bay is a premier, year-round boating resource.

Two other studies provide an indication of recreational use. During USFWS bird surveys in 1993 and 1994 in the south and central Bay, the Service noted boat usage. About 73% were power boats, 14% sail boats, 6% jet skis, and 8% sailboards (windsurfers). About 40% of all boating occurred in the winter months of November through March (comprising 54% of sailboat and jet ski, 38% of power boat use, and 27% of the windsurfing activity). About 81% of the boats counted by USFWS were documented north of the Chula Vista Marina and the southern end of Coronado Cays (US Fish and Wildlife Service 1998). Jet ski usage is concentrated outside Glorietta Bay, east of Harbor Island, and between the Chula Vista Boat Basin and Coronado Cays (Tierra Data Systems 1996). The Bay is renowned worldwide as a premier, year-round boating resource. One company leads kayaking tours in south Bay that highlight views of sea turtles near the CVWR.

North Bay regions would have revealed a higher proportion of sailboats, which are berthed there and often leave the Bay for use at sea. Certain areas of the Bay have concentrated recreational activity. Observing over 47 hours of boat traffic at the America's Cup and Yacht Basins and the launch ramp, the SDUPD (1997a) documented about 200 to 300 vessels moving through each of the basin entrances. During the same period more than 1,000 craft used the launch ramp. On a Saturday morning between 4 and 5 a.m., 54 craft, nearly one per minute, launched from the Shelter Island boat ramp (San Diego Unified Port District 1997a).

3.3.6 Fisheries

Furthering the development of sport and commercial fisheries is one of the purposes mandated by the Port's enabling legislation (San Diego Unified Port District 1980). The Bay supports an estimated 35,000 to 40,000 angler-days per year (number of anglers times the number of days they fished per year), primarily people fishing from boats and using the catch-and-release method (A. Beilstein, San Diego Rod and Reel Club, pers. comm.). Sport fishing in the Bay, however, is not as popular as deep sea fishing in the ocean for yellowtail, yellowfin, albacore, and giant sea bass. A sport fishing fleet operates primarily out of the north Bay from ACH, attracting clients from San Diego and Los Angeles, as well as out of state. In



Map 3-7. San Diego Bay Water Navigation Systems and Restricted Areas.

1978, over 80 part-time and full-time charter vessels operated out of ACH; in 1998, 63 boats were in operation (San Diego Unified Port District 1980; C. Jackson, California Department of Fish and Game, pers. comm.). Each large "partyboat" averages 30 passengers per trip, but smaller "six-pak" charter boats are also popular.

- San Diego is the most popular area in southern California for catching lobster.

Landings of certain sport species (e.g. surfperch, halibut, croakers, sandbass) are periodically monitored through boat and dock checks by NMFS through the Marine Recreational Fishery Sportfishing Survey (MRFSS). No figures are collected by the state or federal agencies on shellfish harvest, although it has been reported in the Bay. A 1992 sport lobster survey listed San Diego as the most popular area in southern California for catching lobster. Inside the Bay, fishermen use hoop nets to catch lobster as scuba diving is prohibited (M. Fluharty, pers. comm.).

- Fishing piers can be found at the Embarcadero, Pepper Park, Bayside Park, Shelter Island, and NASNI.

Sport fishing from personal boats and from piers occurs around the Bay. Public fishing piers can be found at the Embarcadero, Pepper Park, Bayside Park, Shelter Island, and NASNI. In a 1990 study by the County, anglers were surveyed at four locations around the Bay. The study found that 75% of their catch was represented by four species: Pacific mackerel, California lizardfish, barred sand bass, and spotted sand bass. Some ethnic groups fishing the Bay, target finfish and shellfish species not eaten by others. The average fishing frequency of Bay anglers in the survey was 6.4 times per month, with 6% fishing daily (San Diego County 1990).

Photo © 1999 P. Spencer, Tierra Data Systems.

Photo 3-6. Bait for Fishing Available in the Bay.

Based on the potential health risk determined in a toxicological study of sport-caught fish, the San Diego County Health Officer posted health advisories in the summer of 1990 on signs at public fishing piers warning about consuming fish caught in the Bay (C. Gonaver, San Diego County Environmental Health Division, pers. comm.). Sport fishing still continues in the Bay, with the effect of these warnings on the popularity of the sport not yet determined. Since most boat fishing in the Bay is catch-and-release, health risk has probably not affected the level of fishing by this group (B. Fletcher, Sportfishing Association of California, pers. comm.).

- See also Section 4.3.3.1 "Harvest Management."

In the commercial fishery of the San Diego region, about 40 species of fish, crustaceans, and molluscs are allowed to be taken. Local commercial landings from California waters are mainly Pacific bonito, albacore, sea urchin, rockfish, white sea bass, shark, yellowtail, and swordfish. Tuna Harbor symbolizes the Bay's historic use as the home port of long-range tuna seiners. However, this use has dwindled as the stocks decreased and the processing plants went elsewhere. The

number of vessels licensed in San Diego County for commercial fishing (excluding research, party sport fishing, and tuna seiners) averaged 230 in the 1970s, and was 197 in 1998 (San Diego Unified Port District 1980; C. Jackson, pers. comm.). Commercial fishing boat sites in the Bay are located at ACH, the seawall near Harbor Drive, and the G Street Mole (Tuna Harbor) with 98 slips.

One commercial fishing boat operated in the Bay from 1979 to 1995, targeting striped mullet; it is now closed down. Although bait fish (e.g. topsmelt, anchovy) are also caught in the Bay and ghost shrimp are collected in the Bay's mudflats, no reports of these commercial landings are required to be made to the CDFG or the NMFS. Several reasons are suggested as explanation for the decline of commercial fishing in the Bay: the size and shape of the Bay, in combination with the boating activity, makes setting nets very difficult; health concerns about the safety of the Bay's fish due to waters polluted with toxic contaminants and fecal pollution from urban runoff; availability of more desirable fish in the ocean; and reduced fish populations in general. In 1994, state law also required the phasing out of gill net use (M. Fluharty, pers. comm.). Most fish sold in local fish markets are taken in Mexican waters.

3.4 Future Patterns and Plans at the Bay

3.4.1 Navy

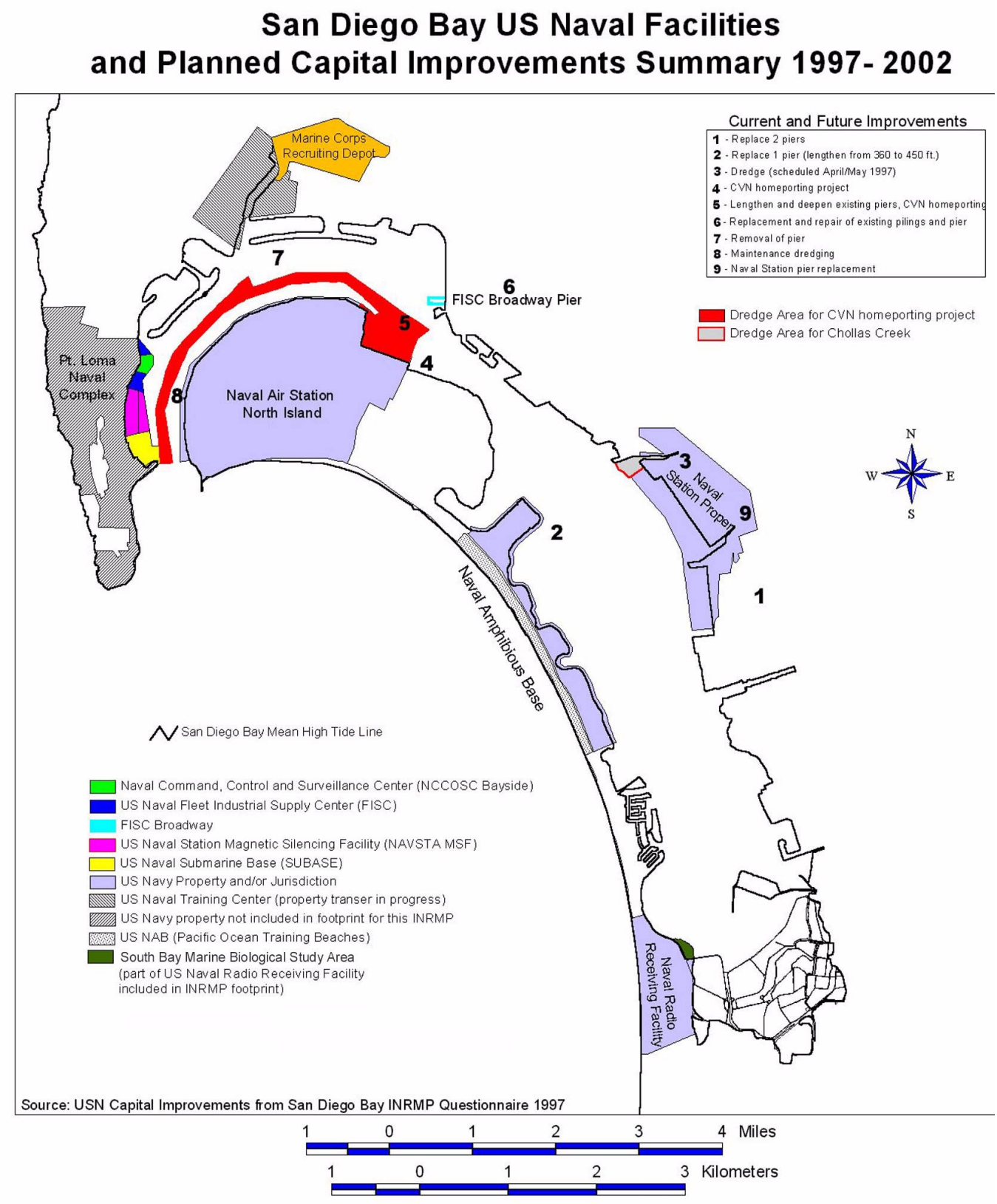
The Navy requires certain in-water construction or maintenance work to support its water dependent uses. A summary of planned capital improvements for Naval facilities for 1997 through 2002 is presented in Map 3-8 and in Table 3-6. These future plans are contingent upon environmental review, with avoidance and minimization of environmental impacts as part of this review process.

A minimum 37 ft (11 m) deep channel from the Coronado bridge to at least Pier 14 is essential for NAVSTA operations. Piers 13 and 14 are relatively shallow, and tugs frequently stir up sediment plumes when berthing ships. NAVSTA recently developed an Environmental Assessment (EA) on use of new deep-draft, power-intensive vessels to the Bay. The next major capital improvement project at NAVSTA ("P326")is to replace the current Piers 10 and 11 with a new Pier 10. Pier maintenance includes occasional pile driving. NAVSTA is using untreated wood pilings on an interim basis and is experimenting with plastic, concrete, and fiberglass pilings to improve water quality. Also at NAVSTA, Paleta Creek is being reconfigured at its mouth for flood control purposes.

Similarly at NASNI, pier pilings replacement is planned on Piers B, J/K, and L/M/N/O/P (Carrier Quay wall) as necessary. NASNI uses untreated wood pilings, which require replacement every year or two. Plastic pilings on Pier B were installed on an experimental basis. On a larger scale, the replacement of Pier J/K for homeporting of an additional nuclear carrier is planned for FY 2000 or FY 2001. The new Stennis carrier is berthed just inside that pier. A third nuclear carrier is planned for berthing along the existing quay wall.

NAB has been experimenting with arsenic-zinc treated pier pilings. They also asked for funding to use plastic composite pilings in the future. These are three times the cost of wood pilings, but last longer. As arsenic-zinc treated and other wood pilings wear out, they hope to replace them with plastic composite pilings. SUBASE is experimenting with composite plastic pilings.

NAB is planning to demolish Pier 15 (currently 360 ft/110 m long) and replace it with a longer (450 ft/137 m) and deeper pier to homeport the new Hurricane-class coastal patrol boats.



Map 3-8. San Diego Bay US Naval Facilities and Planned Capital Improvements Summary (1997–2002).

Table 3-6. Future Navy Plans for In-water Projects.

Base	Project	Completion Date
Naval Station	Introduce new deep-draft, power-intensive vessels. Replace existing Piers 10 and 11 at NAVSTA with a new Pier 10.	1998–2000
NAB	Replace NAB Pier 15 with longer (450 ft/137 m vs. current 360 ft/110 m) and deeper pier to support mooring of the new Hurricane class coastal patrol craft.	
Naval Air Station North Island	Lengthening and deepening of current Piers J/K. Contingent on Chief of Naval Operations approval of homeporting of multiple CVNs.	Contingent
FISC	Repair/replacement of Broadway Pier.	Awaiting funds
ASW Point Loma	Removal of dilapidated small boat pier.	Completed
Naval Air Station North Island	Maintenance dredging for Point Loma Fuel Pier and underbay JP-5 fuel line to NASNI.	1997–2002

3.4.2 Port

Since the Port adopted its 1980 Master Plan, 25 major amendments have been made by the Board of Commissioners (California Coastal Commission 1998). The Port is planning to prepare a new Master Plan. First, each of the nine planning districts will have a new precise plan. For the more developed districts, subarea plans will also be prepared. As of October 1998, the South Embarcadero subarea plan has been completed and has received approval by the Port's Board and by the CCC as an additional amendment to the existing Master Plan. Other precise plans nearing completion are those for the North Embarcadero subarea and for the ACH/Shelter Island area (San Diego Unified Port District 1997b).

Photo © 1999 SDUPD.

Photo 3-7. City of San Diego.

A ten-year (1999–2008) tidelands capital development plan by the Port lists the proposed projects that are pertinent to this Plan's footprint (see Table 3-7).

Table 3-7. Proposed Capital Improvement Program Projects for Port's Tidelands, 1999–2008, Pertinent to this INRMP.

Project Name	Description and Planned Years
Convention Center Dewatering	Provides for construction of an outfall to the Bay to dispose of dewatering effluent from the Center's basement sumps, needed because garage is below water table./FY 99–00/Essential.
Dredge Berth 24-2, NCMT	Dredging berths to –37 ft (–11 m) MLLW to accommodate deeper draft vessels using Berth 24-1, NCMT./FY 99–00/Essential.
Sheet Pile Bulkhead Upgrade and Repairs, TAMT	Design and construction of repairs of existing steel sheet piling at Berths 10-1 and 10-8 at TAMT. Review and repairs of condition of existing galvanic protection system, with new coating for steel sheet pilings in the splash zone./FY 99–00/Essential.
Dredging of ACH	A feasibility study for the deepening of the central harbor to a depth of –20 ft (–6 m) MLLW to improve access and maneuverability for larger vessels./FY 99–00/Very High.
ACH Redevelopment and Infrastructure	Includes street parking, open space, park, public access improvements, environmental enhancement, and shoreline stabilization for 8 acres (3 ha) of land and 12 acres (5 ha) of water./FY 99–03/High.
Bayside Park Sand Replenishment, Chula Vista	Design and construction of sand replenishment portions of a recreational beach area./FY 99/High.
Channel Deepening, Phase I, TAMT	Feasibility study (in progress) and deepening of the central channel and modifications to the wharf at the TAMT to accommodate the deeper draft vessels, extending the Navy's Aircraft Carrier turning basin to the Terminal./FY 99–02/High.
Ferry Landing Marketplace Dock Replacement, Coronado	Installation of a public dock and slip system adjacent to Peohe's at the Ferry Landing Marketplace, as a replacement of deteriorated one that has been removed./FY 99–01/High.
Maintenance Dredging of Fairways and Channels	Maintenance dredging for Port marinas and channels to improve access and ease maneuverability for larger vessels./FY 99–04/High.
South Bay Wildlife Mitigation Bank	To acquire and donate to the USFWS privately held land in South San Diego Bay in exchange for the removal of the least tern nesting site from the NTC and for mitigation credit for future projects within the Bay. Restoration funding to USFWS for the property./FY 99/High.
Acquisition of South Bay Power Plant, Chula Vista	Acquisition of 150 acre (61 ha) power plant (SDG&E) to lease to an operator for a period of up to 10 years, after which plant would be removed and site put to a higher use./FY 99/High.
Channel Deepening, Phase II, NCMT	To extend deepened channel from TAMT to NCMT to allow larger draft ships access./FY 03–08/Moderate.
Grande Caribe Island Development, Coronado	To provide any needed public infrastructure to implement private development of Grande Caribe Island, such as public dock with slips, launch ramp, seawall./FY 03–08/Moderate.
Fuel Dispensing Facility, Recreational Vessels, Chula Vista Marina	Design and construction of new marine fueling facility in an existing site; modify an existing float and landside area to provide a new fueling facility./FY 05–06/Low.
Wharf Extension Phase I, NCMT	To provide for the second 1,025 ft (313 m) of wharf extension south of Berth 24-4 and along the western slope of the NCMT, including slope stabilization./FY 99–03.

- Small projects within the Bay's lower watershed are planned.

In addition, small projects above the elevation of the Plan's footprint but within the Bay's lower watershed are planned. These include paving, drainages, site grading, environmental remediation, parking structures, roadway infrastructure, building demolitions, and area lighting. Redevelopment of the South Embarcadero area between the Convention Center expansion and TAMT is also proposed to be studied. This would entail converting marine-related industrial use to commercial/recreational use with increased access to the waterfront and enhanced public amenities. Creating a visionary plan for the North Embarcadero Redevelopment area in alliance with other entities will be done in FY 99–01. Land acquisition and property exchanges of certain parcels in Chula Vista and National City for the purpose of development or redevelopment are high to moderate priorities for the Port (San Diego Unified Port District 1998). Finally a Port project that would locate the carrier Midway at the FISC Broadway Pier remains in the planning stages.

3.4.3 City Plans

Visions of the future are difficult to pin down, but the following are some of the expressed desires for future land use at the Bay's shoreline and environs:

City of San Diego: In conjunction with the Port, the City is expanding the Convention Center. Expansion of tourist facilities and other uses in the Embarcadero area is a joint effort with the Port and the Navy, which control most of the property. The Otay Mesa-Nestor community plan covers the South Bay.

Chula Vista: One of Chula Vista's top priorities is to develop the waterfront area: new hotels, amphitheater, conference space, water taxi shuttle to the Convention Center. No detailed proposal is prepared yet for the waterfront. Expanding the commercial and industrial uses allowed in the Chula Vista Business Park is proposed as an amendment to the Port Master Plan (San Diego Unified Port District 1997). Otay Valley Regional Park is on the drawing board.

National City: It hopes the newly approved marina will become a tourist attraction and aesthetically improve the area. Improving public access for recreation are main future-uses of interest.

Imperial Beach: Much of the growth in the next two decades is expected in south Bay. The City is mostly built out, and wants to have some access to the south Bay. However, it recently helped purchase a 1.5 acre (0.6 ha) parcel with wetlands values to keep it from development and protect the Tijuana Estuary. Besides wetlands protection, a Festival-by-the Bay is proposed as a future Bay-related use.

Coronado: Along Glorietta Bay, the city is planning redevelopment for new city buildings, a community center, and recreation, including a tree-lined promenade between the Coronado Yacht Club and the NAB. Aesthetic appeal is very important to the city.

3.5 Economics of Use

3.5.1 Navy

As noted in Chapter 1, the USDoD's annual financial benefit to San Diego's economy is estimated at $10.6 billion (San Diego Bay Interagency Water Quality Panel 1997). This value represents the direct and indirect benefits provided by 87,000 sailors, 240,000 family members, and 29,000 civilian employees working at the Navy and Marine Corps bases. The Bay is homeport to over 75 ships that require servicing, supplying, and maintaining. Ship crews also need additional training.

The defense industry in and around San Diego Bay declined dramatically during the Navy downsizing of the late 1980s and early 1990s, affecting the area's economy. Between 1980 and 1990, the Navy sector showed a 10% decrease in employment in the region. The decline will continue in the defense industry and Navy sector, despite the homeporting of NIMITZ class carriers at San Diego Bay (US Department of the Navy 1995).

3.5.2 Port

The Port's bayfront locations for real estate development and maritime trade generated $7.4 billion in 1996–1997 in total economic impact, up from $3.1 billion in 1990–1991 (Greater San Diego Chamber of Commerce 1992; San Diego Unified Port District 1997). Tenants of the Port represent 600 businesses that employ more than 30,000 workers, or one in every seventeen jobs in the region (San Diego Unified Port District 1997b).

- Real estate income from the tenants of the Port produces funds for capital improvements, such as the Convention Center in 1990.

Real estate income from the tenants produces funds for capital improvements, such as the Convention Center in 1990. Marinas pay about 20% of their annual revenues to the Port, with other tenants paying either a flat fee or a combination of flat fees and sales revenues. As much as $20 million in annual revenues is generated by the cruise industry using the Port's terminal as a port-of-call, with a projected increase in visiting cruise ships.

3.5.3 Fisheries

Commercial landings of ocean-caught fish in the San Diego region had a dockside value of $5 million in 1992, while seafood-related employment in canning, curing, and preparing amounted to 323 jobs and a payroll of $12,671,000. Local canneries have since closed down and moved elsewhere due to increased competition from abroad, movement of the fleet to the western Pacific, and changes in oceanographic conditions (Leet *et al*. 1992; McWilliams and Goldman 1994). The wholesale seafood market represented an additional 344 full-time jobs with a payroll of $11,033,000 (McWilliams and Goldman 1994).

The value of sport fishing to the Bay includes (1) the use of passenger vessels (e.g. charter and party boats) harbored there but that provide fishing outside the Bay; (2) the use of personal and rental boats for fishing within the Bay; and (3) the use of shoreline facilities and sites for sport fishing and shellfish harvesting. The economic impact of recreational fishing is much greater than that of commercial industries because of what anglers spend on goods and services related to their fishing trips (McWilliams and Goldman 1994). These expenses include transportation to and from a fishing location; fishing equipment and clothing; food and lodging; and purchasing or renting boats, trailers, and campers. An economic study of the value of the sport fishing industry to San Diego Bay has apparently never been done.

3.5.4 Recreation and Tourism

The Bay's recreational values include both measurable and nonmeasurable benefits. The boating and yachting industry in the Bay offers a tangible economic benefit, though not quantified in any local study. With 8,281 boat slips available at 87% occupancy, the value of this activity could be estimated with some research on goods and services tied to recreational boaters. In addition to marinas and yacht clubs, secondary businesses include boat sales, boat repair, fuel suppliers, food providers, and others. Economic multipliers expand the dollar value through boaters' use of restaurants, retail stores, and transportation to and from their boats. Other types of Bay boating are jet skis, kayaking, canoeing, and sailboards.

Using public parks and beaches does not require the personal investment that boating does. Intangible benefits are provided by these sites, which help improve the quality of life for residents and visitors alike. Valuing the benefits of wildlife and nongame fish to the recreational use of the Bay is also not easily done in dollars. However, the Imperial Beach Bird Fest in 1997 reportedly attracted about 700 people who spent an estimated $178,000 in the area (Klein and Edwards, in US Fish and Wildlife Service 1998).

Beyond recreation, tourist dollars can also be attributable to San Diego Bay. Measuring tourist use can be done in several, often indirect, ways. Most visitor data are available as city wide or county wide summaries and cannot be separated for San Diego Bay alone. One method that the cities use is the Uniform Tourist Tax (formerly Transient Occupancy Tax) collection, which is the tax amount collected from hotel operators as a percentage (@8–10.5% currently) of their rental receipts. Table 3-8 represents nine years of tourist tax collections from the Bay region's five cities. As an indicator of hotel/motel use by tourists, the figures indi-

cate a steady increase in use (assuming stable tax rate) for San Diego and Coronado, amounting to more than double their receipts. Fluctuating usage characterizes Chula Vista, National City, and Imperial Beach, although overall the 1996 receipts are higher than 1988. Recession in the early 1990s, among other factors, may have affected hotel use in those cities. San Diego provides, by far, the greatest number of occupied hotel rooms.

Table 3-8. Uniform Tourist Tax Collections, FYs 1988–1996, for Cities in San Diego Bay Region.[1]

Year	Chula Vista	Coronado	Imperial Beach	National City	San Diego
1988	$1,093,736	$2,209,314	$41,683	$336,929	$26,172,012
1989	$1,098,473	$2,794,284	$48,127	$297,154	$32,098,556
1990	$1,197,988	$3,010,632	$55,199	$426,260	$39,652,1664
1991	$1,130,200	$3,056,997	$64,301	$474,084	$41,852,188
1992	$1,181,074	$3,500,174	$74,056	$529,061	$44,715,037
1993	$1,078,914	$3,733,775	$59,364	$566,744	$45,077,396
1994	$1,041,481	$3,797,418	$46,509	$587,468	$46,126,084
1995	$1,174,242	$4,234,276	$42,734	$563,825	$57,209,949
1996	$1,316,281	$5,294,654	$52,853	$517,185	$64,201,902

1. Source: Research Department, San Diego Convention and Visitors Bureau.

Over one million overnight visitors are recorded for San Diego each month (San Diego Convention and Visitors Bureau—Research Department, 1997). In terms of tourism travel spending (direct and indirect values), San Diego ranks first in California coastal counties with an estimated $1.7 billion value in 1992.

3.5.5 Other Uses

Western Salt Company's salt ponds on south Bay provide an estimated 25 jobs, with annual earnings of $670,000 on sales of $4.9 million (US Fish and Wildlife Service 1998).

3.6 Overview of Government Regulation of Bay Activities

3.6.1 Introduction

Bay activities are regulated by numerous environmental laws and agencies at various levels of government. The purpose of this section is to give an overview of the regulations that can pertain to all types of projects located within and adjacent to San Diego Bay.

- For key jurisdictions of "in-water" Bay projects and pertinent laws, see Figure 3-2.

For projects within the Bay (in-water), Figure 3-2 depicts the key jurisdictions and the underlying laws pertaining to each since the location of projects can trigger different regulations. Location based on tide level, such as mean high water, is important in identifying which agencies become involved in project review. The tidal elevations are specific to the Broadway Pier in the Bay and are interpretations of regulatory guidance. Tables 3-9 through 3-11 summarize the laws and responsibilities for each of the federal, state, and local agencies active in the Bay.

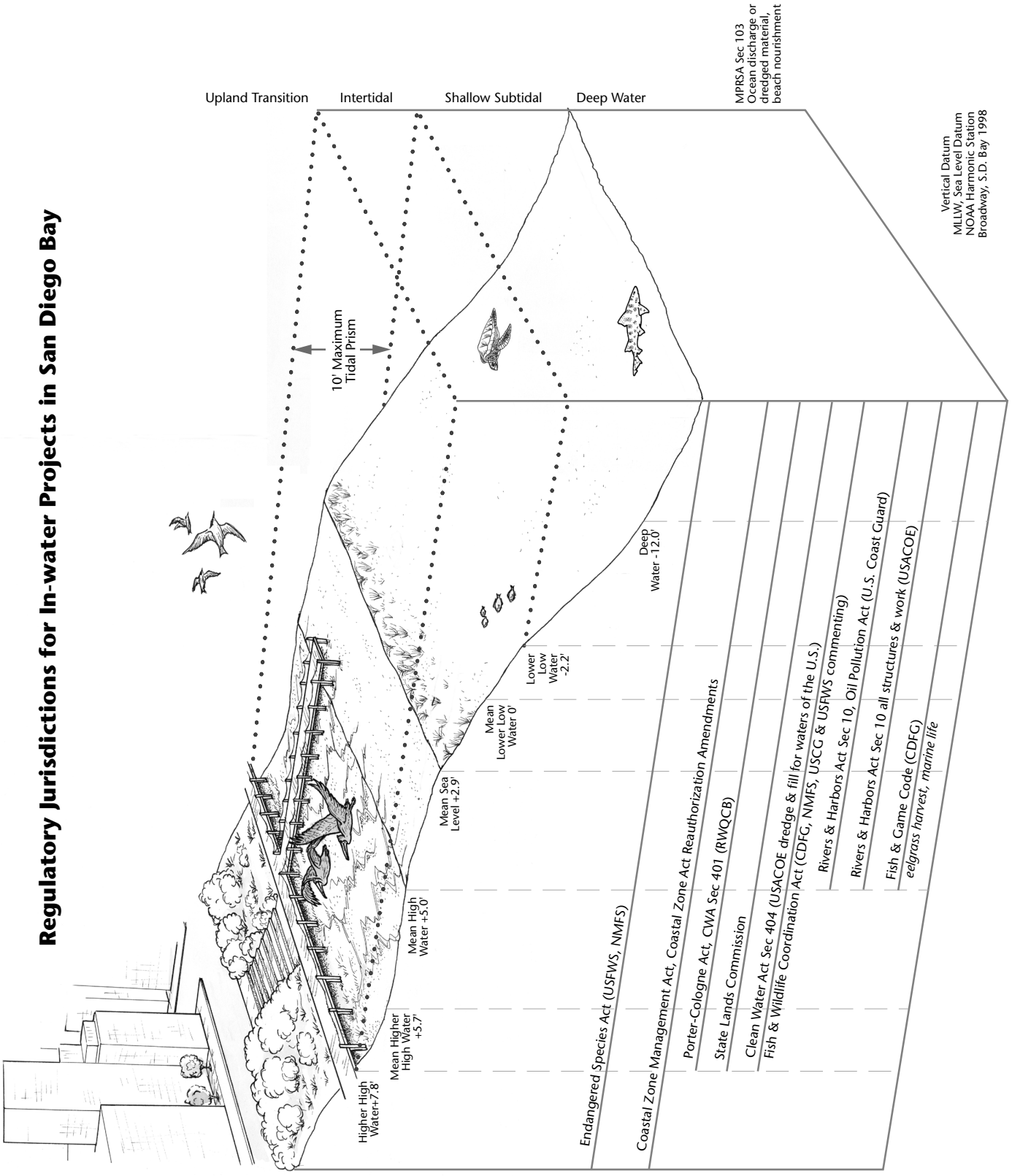


Figure 3-2. Regulatory Jurisdictions for In-water Projects in San Diego Bay (For Tidal Definitions, See Figure 2-3).

3.6.2 Federal Agencies and Laws

Federal laws and regulations pertinent to the Bay primarily target the protection of clean water, wetlands, endangered species, wildlife, and the coastal zone

Water Quality Regulations

- Sec. 404 of the Clean Water Act regulates the discharge of dredged or fill material into designated "Waters of the United States."

One of the laws most commonly affecting Bay projects is Sec. 404 of the federal CWA, passed in 1972 and jointly administered by the USACOE and the EPA. This section of the law regulates the discharge of dredged or fill material into the "Navigable Waters of the United States," which also includes "wetlands" (Cylinder *et al*. 1995). The USACOE is responsible for developing regulations for the Sec. 404 permit process and issuing permits, with the EPA maintaining power to veto the USACOE's decisions. USACOE's regulatory jurisdiction for tidal waters under Sec. 404 extends up to the high tide line (higher high water mark in San Diego Bay) (see Figure 3-2).

In this coastal wetland zone, the USACOE requires permits for certain structures, such as groins, breakwaters, riprap, jetties, and beach nourishment activities. Overlapping with the CWA below the mean high water line is authority under Sec. 10 of the Rivers and Harbors Act of 1899, which gives the USACOE jurisdiction over projects involving construction, excavation, and deposition. Projects located in this lower zone also require permits, such as new marinas, piers, wharves, floats, intake and outfall pipes, pilings, bulkheads, and boat ramps, as well as dredge and fill.

The USCG issues permits for bridges over navigable waters under Sec. 10 of the Rivers and Harbors Act, such as the one crossing the National Training Center Channel. For both Sec. 404 and Sec. 10 permits, mitigation for impacts may be required.

- Mitigation for impacts may be required for Sec. 404 and Sec. 10 permits. Conditions may be part of a permit but are not required.

Beyond the direct permitting authority of the USACOE is the commenting authority available to other federal agencies through the Sec. 404 permit process. Commenting authority to the Corps on specific projects is provided by the USFWS and the NMFS, for example, because of requirements of the Fish and Wildlife Coordination Act. If the USACOE supports their comments, then their proposals for project mitigation can become conditions of the permit, even though these two agencies do not have direct regulatory authority under the CWA. Examples of their mitigation concerns are added measures to ensure eelgrass and mudflat habitat protection and restoration as a means to protect fish and wildlife populations.

Endangered Species Regulations

- For more on ESA, see Section 4.3.6 "Sensitive Species Special Protections."

Another frequently encountered federal law is the ESA. Its provisions are also discussed under Sensitive Species in Chapter 4 "Ecosystem Management Strategies." Once a species becomes listed as endangered or threatened, regulations to protect the species from illegal "take" become applicable to any project that may affect an individually listed animal or its habitat. The USFWS oversees the ESA implementation for all species except most marine species, which are under NMFS jurisdiction. Since the Bay presently supports eight federally listed species, these two agencies become involved in all projects potentially affecting any of these species.

- The USFWS and the NMFS are involved in all projects that potentially affect the listed species in the Bay.

Under Section 7 of the ESA, federal project proponents must consult with USFWS or NMFS if one or more listed species may be affected by an action. Consultation with USFWS or NMFS may range from informal discussions to formal consultation requiring a biological assessment by the project proponent. For nonfederal project applicants, the USACOE takes the lead in this consultation if the issue is within their jurisdiction. Other federal agencies may appropriately be named the action agency that must conduct the consultation. With the issuance of a Biological Opinion, "terms and conditions" are stated, which are measures

Table 3-9. Federal Agencies with Responsibilities for Natural Resources in San Diego Bay. [1]

Federal Agencies and Applicable Laws	Authority and Activities
US Army Corps of Engineers (USACOE)	
■ Clean Water Act, Sect. 404	■ Responsible for issuing Sect. 404 permits for dredged or fill material into waters of the US (up to higher high water line in tidal waters) and into wetlands in compliance with EPA regulations.
■ Rivers and Harbors Act of 1899, Sect. 10	■ Regulates construction, excavation, and deposition in navigable waters (up to mean high water in tidal waters).
■ Marine Protection, Research, and Sanctuaries Act (MPRSA) of 1972, Sec. 103	■ Regulates dumping and transport for dumping of material into US waters.
■ National Environmental Policy Act	■ Commenting or lead agency authority for environmental review of proposed projects.
US Environmental Protection Agency	
■ Clean Water Act, as amended	■ Develops Sect. 404 regulations and may veto USACOE Sect. 404 permit. ■ Regulates waste disposal in coastal waters. ■ Administers (with NOAA) the Coastal Nonpoint Pollution Control Program. ■ Administers National Estuary Program (NEP).
■ National Environmental Policy Act	■ Commenting authority on proposed projects.
■ Marine Protection, Research, and Sanctuaries Act of 1972	■ Regulates waste disposal in coastal waters.
US Fish and Wildlife Service	
■ Fish and Wildlife Coordination Act	■ Reviews and comments on federal actions that affect many habitat-related issues, including wetlands and waters considered under Clean Water Act Sect. 404 and Rivers and Harbors Act Sect. 10 permit applications.
■ Federal Endangered Species Act	■ Regulates, monitors, and implements programs for protecting the ecosystems upon which freshwater and estuarine fishes, wildlife, and habitat of listed species depend. Enforces international treaties and conventions related to species facing extinction.
■ Migratory Bird Treaty Act	■ Enforces prohibition against the taking of migratory birds, their eggs, or their nests.
■ National Wildlife Refuge System Administration Act	■ Designates lands for the conservation of fish and wildlife as part of the National Wildlife Refuge System.
■ National Environmental Policy Act	■ Commenting authority on proposed projects.
National Marine Fisheries Service	
■ Fish and Wildlife Coordination Act	■ Reviews and comments on federal actions that affect marine fishery resources and many habitat-related issues, including Clean Water Act Sect. 404 and Rivers and Harbors Act Sect. 10 permit applications.
■ Federal Endangered Species Act	■ Jurisdiction over most threatened or endangered marine species, including the green sea turtle (outside of beach nesting sites).
■ Magnuson-Stevens Fisheries Conservation and Management Act	■ Responsible for maintaining and conserving fisheries and rebuilding overfished stocks. Responsible for determining whether projects or activities adversely impact Essential Fish Habitat zones (those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity).
■ Marine Mammal Protection Act	■ Enforces protection provisions for marine mammals.
■ National Environmental Policy Act	■ Commenting authority on proposed projects.
US Coast Guard	
■ Ports and Waterways Safety Act	■ Manages maritime transportation and bridges over navigable waters. Permitting for marine events (e.g. America's Cup). Responsible for maritime safety/law enforcement, and environmental protection. Establishes safety standards and conducts inspections.
■ Oil Pollution Act of 1990	■ Ensures cleanup of marine oil spills and other pollutants. Responsible for oil spill responses based on Area Contingency Plan. Prepares most regulations needed for implementation of Oil Pollution Act.
■ Fish and Wildlife Coordination Act	■ Commenting authority on navigational issues, such as structures affecting navigation, USACOE Sect. 404 dredge and fill permits, and new pilings.
■ Rivers and Harbors Act of 1899, Sect. 10	■ Issues permits for bridges over navigable waters (up to mean high water line).
■ Clean Water Act/Marine Protection, Research, and Sanctuaries Act	■ Enforces standards of oil and other hazardous waste discharge in marine waters.

1. Sources: Cylinder *et al.* 1995; Bass and Herson 1993; California Resources Agency 1997.

to avoid or minimize the take of any listed species. When an "incidental take statement" is issued with the biological opinion, the federal project proponent may be excused from incidentally taking a listed species as part of the agency's otherwise lawful activity as long as the specified taking conditions are met. Section 10 of the Act also provides for a similar incidental take permit for private, state, and local government projects. To qualify, the project proponent must submit a habitat conservation plan and also seek to minimize and mitigate the impacts of the taking to the "maximum extent practicable" (Mueller 1994). This plan must then undergo an internal Section 7 review and are also subject to environmental review under NEPA.

Migratory Bird Protection

- USFWS has sole authority to enforce federal migratory bird statutes regulating the take of federally protected species.

A less known but influential law is the Migratory Bird Treaty Act of 1918, which prohibits the taking, whole or in part, of migratory birds, their eggs, feathers, or nests. Most birds are prtected under the MBTA. Game birds are listed and protected except where specific seasons, bag limits, and other factors govern their hunting. Exceptions are also made for some nuisance pests, which require a federal depredation permit (e.g. yellow-headed, red-winged, bi-colored red-winged, tri-colored red-winged, Rusty and Brewer's blackbirds, cowbirds, all grackles, crows, magpies, rock doves, European starlings, and house sparrows).

The USFWS has sole authority for coordinating and supervising all federal migratory bird management activities, including enforcement of federal migratory bird statutes regulating the taking of federally protected species (game and nongame) by individuals and federal agencies. That federal agencies are subject to the MBTA was recently confirmed in a July 18, 2000 court decision (Humane Society of the U.S. vs. Glickman, Secretary of Agriculture). With more law enforcement officers, the CDFG plays a major role in enforcing the statutes (Eno and DiSilvestro 1985). This Act provides the USFWS opportunity to comment on projects potentially affecting bird species, and their habitats, that are not protected under the federal ESA.

Coastal Zone Laws

- NOAA oversees the CZMA and the CZARA. The CCC has authority to implement their provisions.

Two additional federal laws operate in the coastal zone: the Coastal Zone Management Act (CZMA) of 1972, and the Coastal Zone Act Reauthorization Amendments (CZARA) of 1990. While the NOAA oversees the Acts, the CCC has authority to implement their provisions. If activities on lands excluded by the Act ("lands held in trust by or which uses are subject solely to the discretion of the federal government"), such as US Navy lands, "may affect" the coastal zone, then they must be reviewed for consistency with the California Coastal Management Plan (CCMP) based on Sec. 307 of the CZMA. Before the 1990 changes, the law read "directly affect" but now it reads only "affect." Federal rules for federal consistency can be found in 15 C.F.R. Sec. 930.35–37. See further discussion on CZMA consistency under State Agencies and Laws below.

3.6.3 State Agencies and Laws

California's natural resource laws provide another level of environmental protection. State agencies are responsible for implementing certain federal laws as well as state laws. For example, delegation has been given to the SWRCB by EPA to administer portions of the federal CWA and CZARA and also to the CCC to implement the federal CZMA and CZARA (as noted above). Table 3-10 lists the state agencies, laws, and authority that pertain to San Diego Bay. A description follows of major state regulations that project planners should be aware of.

Table 3-10. State Agencies with Responsibilities for Natural Resources in San Diego Bay.[1]

State Agencies and Applicable Laws	Authority and Activities
California Coastal Commission	
■ CCA of 1976 ■ Federal Coastal Zone Management Act of 1972 ■ Federal Coastal Zone Act Reauthorization Amendments ■ California Environmental Quality Act of 1970	■ Administers state and federal coastal acts by developing policies for implementation by local government through LCPs and Port master plans, which must be approved by CCC to allow local permitting authority in coastal zone. ■ Retains permanent permit jurisdiction for proposed projects within the immediate shoreline (tidelands, submerged lands, and public trust lands). ■ Regulatory control over federal activities in the ocean, such as dredge disposal. ■ Works with SWRCB to develop Coastal Nonpoint Pollution Control Program. ■ Commenting authority.
State Lands Commission	
■ Public Trust Doctrine ■ Public Resources Code ■ California Environmental Quality Act	■ Exclusive jurisdiction over all ungranted tide and submerged lands that are state owned. ■ Assists with use-related issues on Port tidelands and reviews Port-related projects on state trust lands. ■ May preclude the use of submerged lands and tidelands if inconsistent with public trust; requires Land Use Lease for encroachments, docks, crossings. ■ Establishes the ordinary high water mark and ordinary low water mark. ■ Commenting authority.
California Department of Fish and Game	
■ California Fish and Game Code ■ Public Resources Code ■ California Endangered Species Act ■ California Oil Spill Prevention and Response Act of 1990 ■ California Environmental Quality Act ■ Fish and Wildlife Coordination Act	■ Conducts biological studies on fish and wildlife. ■ Regulates activities resulting in alteration of lakes and streams. ■ Manages sport and commercial harvest of fish and wildlife and aquaculture ■ Investigates pollution and toxic spills, in cooperation with SWRCB and RWQCB. ■ Enforces protection of state-listed sensitive animal and plant species. ■ Responsible for oil spill prevention, response, cleanup, and natural resource damage assessment in state waters. ■ Provides recommendations to other state agencies to prevent or mitigate adverse impacts on fish and wildlife; also has commenting authority on federal projects.
State Water Resources Control Board (SWRCB)	
■ Federal Clean Water Act ■ Porter-Cologne Water Quality Control Act ■ California Water Code ■ Federal Coastal Zone Act Reauthorization Amendments ■ California Environmental Quality Act	■ Protects water quality and administers water rights. ■ Designates beneficial uses and water quality objectives and protects beneficial uses statewide; adopts California Ocean Plan and an Enclosed Bays and Estuaries Plan. ■ Develops statewide nonpoint source pollution control plan. ■ Develops program to identify and clean up toxic hot spots in bays. ■ Working with CCC and RWQCB to develop and implement Coastal Nonpoint Pollution Control Program. ■ Commenting authority.
Regional Water Quality Control Board (RWQCB)	
■ Federal Clean Water Act, Sec. 401, 402 ■ Porter-Cologne Water Quality Control Act ■ California Environmental Quality Act	■ Daily regulation of point source discharges, stormwater discharges, underground storage tanks, and above ground petroleum tanks. ■ Designation of beneficial uses and water quality objectives, and protection of beneficial uses for San Diego Region through adopted Basin Plan. ■ Prepares public reports on condition of water bodies. ■ Develops program to identify and clean up toxic hot spots in bays. ■ Commenting authority.
California Department of Pesticide Regulation	
■ Various pesticide regulations	■ Regulates antifouling paints used on boats and ships.
California Department of Parks and Recreation	
■ Public Resources Code ■ California Environmental Quality Act	■ Acquires and manages coastal lands for resource preservation and park and recreational uses; manages Silver Strand State Beach on the Bay. ■ Commenting authority.

1. Sources: Cylinder *et al.* 1995; Bass and Herson 1993; California Resources Agency 1997; *http://ceres.ca.gov.*

Coastal Land Use Regulations

Coastal land use is also controlled by the state. The CCA of 1976 implements California's Coastal Zone Management Program as required by the federal CZMA of 1972 (California Resources Agency 1997). It regulates public access, recreation, marine resources, land resources, and development within the coastal zone. Overseeing the Act's implementation is the CCC, which has permanent permit jurisdiction for proposed projects within the immediate shoreline (tidelands, submerged lands, and public trust lands). It also seeks to ensure that local governments within the coastal zone prepare an adequate LCP based on the CCMP. Once an LCP is certified by the CCC, the local government can issue its own development permits for most projects.

- The CCA's provisions regulate San Diego Port's tidelands.

California ports must have Port master plans certified as being in conformance with the CCA in order to have their own development permit authority. The Act's provisions regulate all of the Port's tidelands: Chapter 8 (Ports) and Chapter 3 (Coastal Resources Planning and Management Policies) for wetlands, estuaries, and existing recreation areas. Based on Chapter 3 policies, certain development projects that are normally port-related can be appealed to the CCC while other projects are considered nonappealable. These appealable projects are identified in the Port Master Plan under each planning district. When the CCC certified the Port Master Plan in 1981, certain modifications were required as conditions of approval. One of the conditions added was that the Port "shall insure that there will be no net loss of habitat" for "rare and endangered" species on Port lands (San Diego Unified Port District 1996a).

- Activities covered under CZMA include dredge disposal and dumping of military surplus.

The CCC has regulatory control over federal activities in the federal Outer Continental Shelf that affect the state's ocean and coastal resources. Dredge disposal and the dumping of military surplus are examples of such activities covered by this federal consistency requirement under CZMA.

For federal lands, all lands that are held in trust by or which uses are subject solely to the discretion of the federal government are excluded from California's coastal zone. Examples would include all property within NAB and North Island not directly on the Bay or the ocean. The City of Coronado has asked for CCC review of Navy projects that could affect their city, such as traffic and noise, and the Navy has complied with this review. Most Navy projects are reviewed on a case-by-case basis with no specified criteria established to identify which types of Navy activities have no effect on the coastal zone and, therefore, do not require review for federal consistency. However, there are several options that could help make the review of minor Navy projects more predictable and less cumbersome (M. Delaplaine, California Coastal Commission, pers. comm.)

A General Consistency Determination can be done with the Navy for a whole class of activities under a master review. In 1993, the CCC granted the Navy for the San Diego Bay area a General Consistency Determination for periodic replacement and repair of piers and shoreline structures (California Coastal Commission 1993). The Navy had to clearly define the types of projects allowed and is required to notify the CCC of an activity being conducted pursuant to this Determination before the Navy awards the contract. The Consistency Determination expires in five years (last renewed August 11, 1998, CD-070-98). To adopt the decision, the CCC had to find that this proposed project "is consistent with the marine resource, habitat, access, recreational, and shoreline structure policies of the CCMP."

A Negative Determination, usually done on a case-by-case basis, avoids formal review. Projects can get this determination if:

1. the project clearly has no impact on the coastal zone; or
2. the project is clearly similar to another project that was previously determined by the CCC to have no impact.

Projects that could fall under the "no impact" category can often be determined using the "common sense" rule, which also means "if in doubt, ask." Some projects appear obviously exempt (e.g. modification to existing buildings). A review of Navy master plans for each facility by the CCC can also give project planners an idea of which projects will likely need further review. However, certain routine projects, such as maintenance dredging, are not exempt because of the CCC's need to ensure that all relevant federal and state agency concerns (e.g. eelgrass, California least terns) are addressed, such as the disposal of dredge spoils (M. Delaplaine, pers. comm.).

Water Quality Regulation

- Beneficial uses and water quality objectives for coastal waters of San Diego Bay are identified and established by the Comprehensive Water Quality Control Plan for the San Diego Region.

Water quality protection in the Bay is under the responsibility of the SWRCB and the RWQCB San Diego. Authority comes from the state's Porter-Cologne Water Quality Control Act and the federal CWA. With the SWRCB setting statewide water quality objectives, the RWQCB carries out specific aspects of surface and coastal water regulations. A Comprehensive Water Quality Control Plan for the San Diego Region, adopted by the nine-member RWQCB, identifies existing and potential beneficial uses and establishes water quality objectives for coastal waters such as San Diego Bay. If the SWRCB adopts a "Water Quality Control Plan for Enclosed Bays and Estuaries of California," its provisions will supersede those of the Regional Plan.

Implementation of the plans occurs through the issuance of permits for waste discharges under the National Pollution Discharge Elimination System (NPDES) by the RWQCB. Regulations initially focused on controlling "point source" (end-of-pipe) discharges, such as from sewage treatment, industrial, and power plant outfalls. Recently, point source discharges from commercial shipyards and boatyards in the Bay have come under General NPDES permits. The Navy's General State Water Quality Certification was approved on November 2, 1998 (98C-127).

- See Section 5.2.2 "Storm water Management" for discussion of regulatory details.

With point sources under control, emphasis has turned to regulating stormwater discharges from various sources through storm drains as well as runoff sources of nonpoint source pollution. As the result of amendments to the CWA (Sec. 402[p]) and to the Coastal Zone Act (CZARA Sec. 6217), storm drains are being treated as a point source of pollution and are required to come under NPDES permit. The Port, the county, and the cities are all under a General Municipal Stormwater Permit. In Phase II, CZARA is requiring that small construction sites (<5 acres/2 ha) also be included under a stormwater permit. Industrial stormwater permits are maintained by the Port for the airport and marine terminals. All US Navy facilities are also subject to the statewide General Industrial Stormwater Permit.

Enforcement of NPDES permits by the RWQCB is done when monitoring or other source indicates a violation of permit conditions. Cease and Desist Orders and Cleanup and Abatement Orders can be issued along with stiff financial penalties can be issued for noncompliance.

State Tideland Authority

The Port operates on sovereign state land granted to it in trust by the Legislature for the purpose of operating and maintaining port facilities for statewide benefit. As such, the SLC is charged with overseeing the use of sovereign land and retains any authority not granted in trust. The SLC wants to ensure that projects on public trust lands are consistent with the terms of the legislative grant supporting maritime commerce, navigation, fisheries, and recreation.

Under CEQA review of Port projects, the SLC acts as a "responsible agency" and participates with many other state agencies in evaluating environmental impacts and establishing fish and wildlife mitigation requirements (California Resources Agency 1997). The SLC also provides technical assistance to the CCC on federal consistency reviews for projects on leased state tidelands. For encroachments, docks, or crossings on tidal and submerged lands under its jurisdiction, the SLC will require a Land Use Lease (California OPR 1980).

3.6.4 Local Agencies and Laws

Local agencies include the land use, environmental, and public works departments and divisions within the Port, San Diego County, and the five cities surrounding the Bay: Chula Vista, Coronado, Imperial City, National City, and San Diego. As with the state, local government is charged with implementing state and federal laws as well as local laws. Table 3-11 provides a general listing of the pertinent agencies, laws, and authorities of these various local agencies.

Table 3-11. Local Agencies with Responsibilities for Natural Resources in San Diego Bay.

Local Agencies and Applicable Laws	Authority and Activities
San Diego Unified Port District	
■ State Port District Act of 1962	■ Enables Port to operate and to promote the development of commerce, navigation, fisheries; and recreation within the Port.
■ Port Master Plan	■ Provides planning policies for the physical development of the Port's trust lands.
■ Port Ordinances/Code	■ Regulates the conditions of use within Port's jurisdiction.
■ CCA of 1976	■ Authority to issue its own coastal development permits once Master Plan is certified by CCC.
	■ Lead agency and commenting authority on projects and plans.
■ CEQA	
City and County Planning/Community Development Departments	
■ State Planning and Zoning Law	■ Establishes state rules and guidelines for cities and counties.
■ State Subdivision Map Act	■ Establishes state rules and procedures for local subdivision ordinances.
■ Local general plan	■ Provides policy direction for land use, conservation, transportation, housing, and safety.
■ Local Ordinances: zoning, grading, etc.	■ Implements policies of the general plan.
■ CCA of 1976	■ Authority to issue own coastal development permits once LCP certified by CCC.
- Local Coastal Plan element of general plan	■ Lead agency and commenting authority on projects and plans.
■ CEQA	
City and County Public Works Departments	
■ State Safety and Public Works Statutes	■ Establishes state rules and guidelines for cities and counties.
- Ordinances (flood control, stormwater, etc.)	■ Regulates use and procedures for maintaining public facilities.
San Diego County Department of Health Services, Environmental Health Division	
■ State Health and Safety Code	■ Establishes state rules and guidelines for cities and counties.
- Local Ordinances	■ Regulates use and procedures for maintaining public health.

Land Use

State planning and zoning law establishes the rules and guidelines for local government plans and their implementation (California OPR 1984). Each of the five cities and the county have adopted general plans to govern their current and anticipated land uses, along with required Elements (e.g. Housing, Transportation, Conservation, and Open Space) and specific plans for subareas within their jurisdiction. These land use strategies have goals, objectives, and policies within their text and depicted in maps. Land use zones depict where different uses and densities are to be allowed, with zoning ordinances defining the allowable uses for each zone.

Local coastal plans provide more specific strategies for the portion of their jurisdictions lying within the state-defined coastal zone. All LCPs for Bay jurisdictions have been approved by the CCC as being in conformity with the CCMP. The official Coastal Zone for the Bay region encompasses all land and water from the ocean to Interstate 5 on the east, and to Rosecrans Street to the north end of the Bay. Much, but not all, of this land is within the Port jurisdiction. The county and the Port member cities have incorporated the certified Port Master Plan into their own LCPs. To implement the Master Plan, the Port has adopted Coastal Development Permit Regulations. Permit issuance by the Board of Port Commissioners is based solely on the conformity of the proposed development with the certified Port Master Plan.

Water Quality Protection

- To minimize runoff pollution from construction sites, some local agencies have adopted Grading Ordinances.

Implementation of federal and state water quality mandates occurs a great deal at the local government level. To comply with the RWQCB's NPDES permit, the Port is managing stormwater pollution through Port ordinances and the enforcement of its member cities' stormwater ordinances. Some local agencies have adopted Grading Ordinances to minimize runoff pollution from construction sites. The San Diego County Environmental Health Division seeks to protect public health from the effects of polluted water and can close sites to fishing, swimming, or other uses when needed.

- A model Water Quality Element has been prepared by SANDAG to provide consistency among local agency regulations.

Applying for a local development permit within the county, cities, or Port jurisdictions triggers a multiagency project review to ensure compliance with the state and federal water quality regulations, as depicted in Figure 3-3. To help provide consistency among the local agencies' regulations, the SANDAG has prepared a model Water Quality Element with specific measures that can be taken by local jurisdictions to address the adverse impacts of land development to the region's surface and groundwaters.

3.6.5 Project Mitigation Under NEPA and CEQA

Project mitigation is usually required as a condition of approval for permits by regulatory agencies. It is also used as a means to address adverse environmental impacts through the federal (NEPA) or state (CEQA) EA processes. The process of these two laws can also cause considerable delay with project implementation. On the other hand, NEPA and CEQA provide a useful planning tool to clearly evaluate the effects of decisions on the environment and to solve any potential problems as early in the process as possible. An overview of these acts and their roles with project mitigation follows. A typical project flow chart is shown in Figure 3-3.

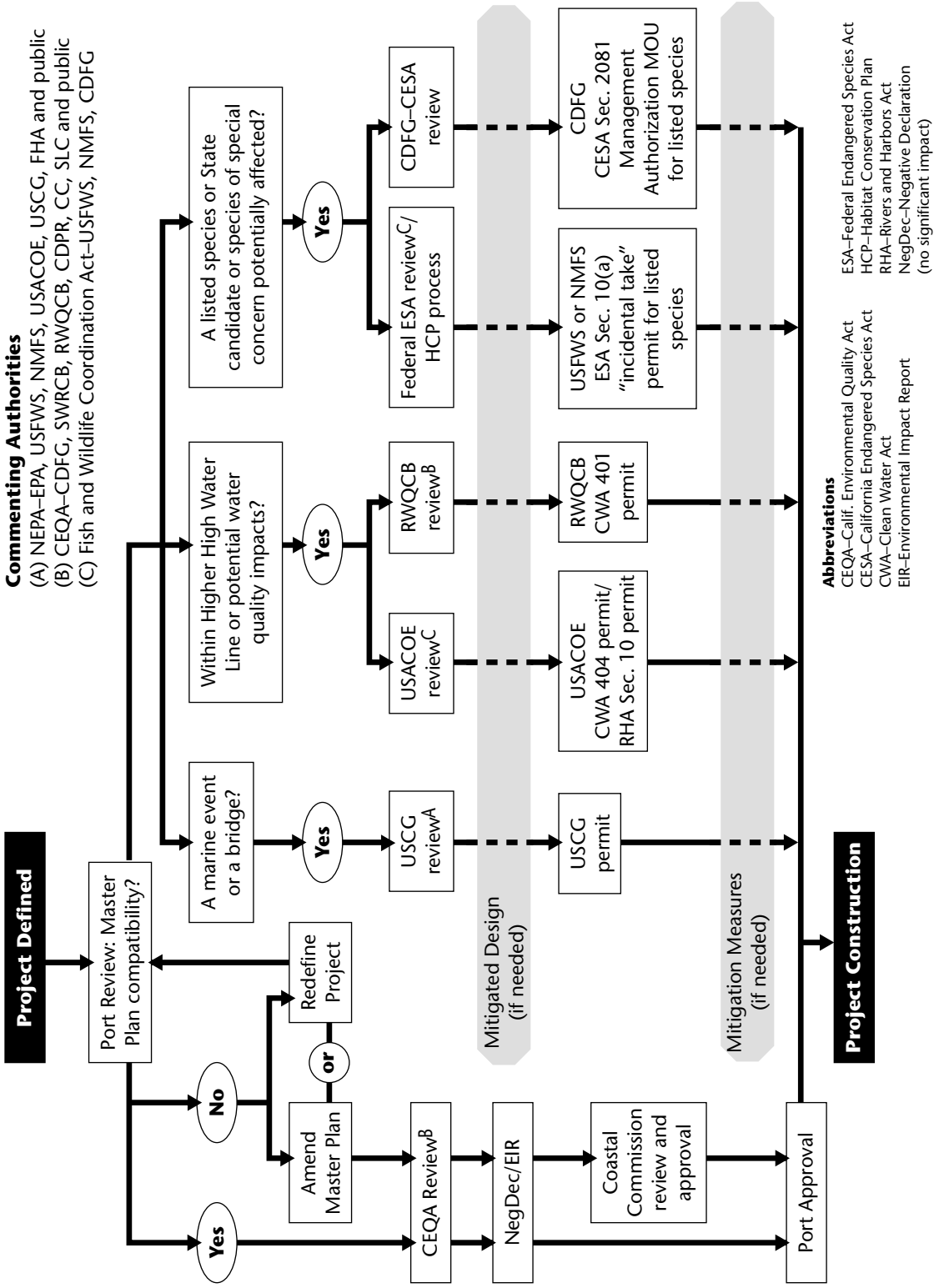


Figure 3-3. Typical Project Processing Flow Chart.

NEPA and CEQA Processes

- Both the federal and state Environmental Assessment Acts provide similar processes to evaluate and solve the environmental impacts of proposed projects.

Both the NEPA and the CEQA were adopted in 1970 and possess many similarities. Activities directly undertaken by, financed by, or requiring approval of federal or state and local agencies, respectively, are subject to NEPA or CEQA environmental review processes, with only some specified exceptions. Several levels of review intensity are provided, and guidelines for implementation are adopted that are quite binding on the agencies. When a project has both federal and state/local activities that are subject to the Acts, a joint NEPA/CEQA process can be carried out. Handbooks are available to help project planners comply with either act (Bass and Herson 1993a, b; Bass *et al.* 1999). A comparison of the two processes is shown in Figure 3-4 (from Bass *et al.* 1999).

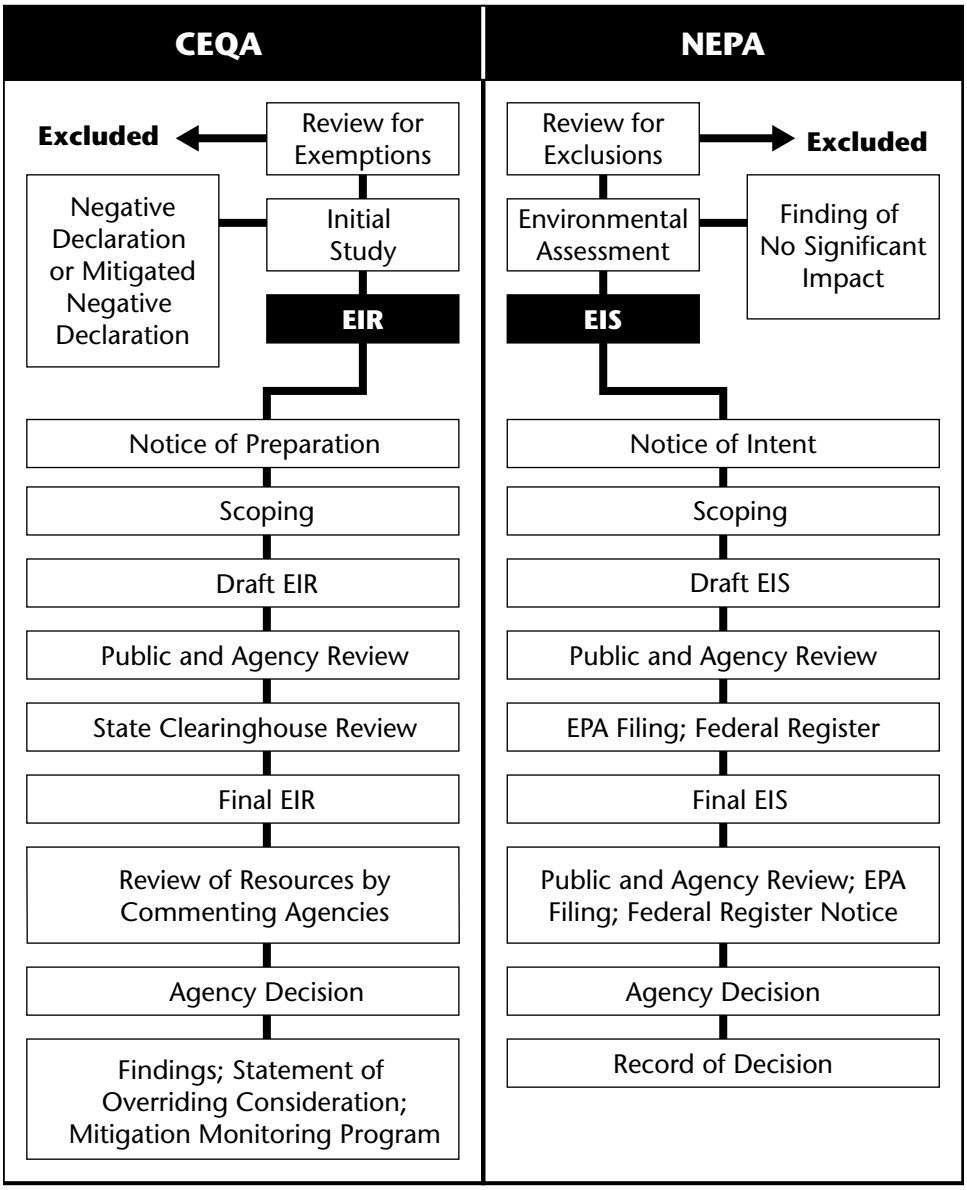


Figure 3-4. Comparison of CEQA and NEPA Review Processes (From Bass et al. *1999).*

National Environmental Policy Act

- The most important function of agency compliance with NEPA procedure is to ensure that the environmental consequences of the agency's action have been considered.

The NEPA statute and the Council on Environmental Quality (CEQ) regulations combine to represent the "letter and spirit" of the Act. To help with implementation, CEQ has issued guidelines that every federal project planner should read: "Forty Questions" (1981), "Scoping Guidance" (1981), and "Guidance Regarding NEPA Regulations" (1983). The most important function of agency compliance with NEPA procedure is to ensure that the environmental consequences of the agency's action have been considered. Agencies do not have to reject environmentally damaging proposals due to NEPA (Bass and Herson 1993a).

- Navy projects must follow a specific Navy policy direction to meet NEPA compliance.

For Navy projects, the USDoD has issued policy and procedures for its components. A supplement providing policy and assigning responsibilities was later adopted by the US Department of the Navy (32 CFR part 775). These Navy procedures meet the NEPA requirement that every federal agency adopt procedures to supplement CEQ regulations. Following the Navy directive, specific policy for compliance with procedural requirements was issued under a Navy Instruction (OPNAVINST 5090.1B, Ch.5). This latter document tasks each Naval installation with ensuring that Navy actions are in accordance with the letter and spirit of NEPA.

- A project under NEPA must be evaluated on its potential to "*significantly affect the quality of the human environment.*" The term "significantly" is determined by considering the context in which it will occur and the intensity of the action. "Human environment" is a comprehensive phrase that includes the natural and physical environments and the relationship of people with those environments.

A proposed federal agency action is first reviewed to see if it can qualify for a categorical exclusion (usually small, routine projects with no potential significant environmental effect; categories are identified in agency NEPA policies) or other exemption to the process. If not, then an EA is prepared by the Lead Agency. If the EA concludes adverse environmental impacts will be insignificant, then the agency can file a Finding of No Significant Impact, followed by its chosen action. If the proposed project has the potential to "significantly affect the quality of the human environment," then the Environmental Impact Statement (EIS) process must be followed. Briefly, these steps are: Notice of Intent, Scoping Process, Draft EIS, agency/public Review and Comment, Final EIS, Record of Decision, and agency action.

The Lead Agency is the federal agency with primary responsibility for preparing an EIS. A Cooperating Agency is any federal agency other than the Lead Agency that has jurisdiction by law or special expertise with respect to the environmental impacts expected to result from a proposal. A Lead Agency must request participation of Cooperating Agencies early in the NEPA process, use their analyses as much as possible, and meet upon their request. A Cooperating Agency must participate in the process unless resource limitations must limit its involvement (Bass and Herson 1993a).

California Environmental Quality Act

- Extensive revisions to the CEQA Guidelines were approved in late1998 to reflect new statutes and recent court decisions.

CEQA is administratively implemented by guidelines prepared by the state Office of Planning and Research (OPR) and adopted by the Secretary of the Resources Agency. Extensive revisions to the CEQA Guidelines were approved in late 1998 by the state Office of Administrative Law to reflect new statutes and recent court decisions. All discretionary projects proposed to be carried out or approved by state or local agencies must comply with CEQA. Exemptions include ministerial projects, emergency repairs, and minor construction or reconstruction projects (Bass and Herson 1993b).

An Initial Study is prepared for a project by the lead agency to determine if the project may have a significant effect on the environment. At this point, the project sponsor can modify the project so that any adverse impacts are miti-

gated. If there is no significant environmental impact, the initial study should provide documentation for such a finding in a Negative Declaration ("NegDec"). If significant impacts that cannot be mitigated exist, the lead agency must prepare an Environmental Impact Report (EIR). Briefly, the EIR process is the following: Notify responsible agencies and public, Issue and Scope Identification, Draft EIR, Notice of Completion of Draft EIR, Public Review Period, preparation of Response to Comments, Final EIR, adoption of Final EIR, and agency decision.

■ "Significant effect on the environment" is defined in CEQA to mean a substantial or potentially substantial, adverse change in any of the physical conditions within the area affected by the project, including land, air, water, minerals, flora, fauna, ambient noise, and objects of historic or aesthetic significance.

A CEQA Lead Agency is the public agency that has principal responsibility for carrying out or approving a project; a Responsible Agency is any other public agency with discretionary authority over a project; and a Trustee Agency is a state agency that has jurisdiction over natural resources held in trust for the people of the state of California (e.g. CDFG, SLC). The Lead Agency must coordinate and consult with the other agencies during the CEQA process

Mitigation Measures

"A solution to an environmental problem" is a simple definition of a mitigation measure (Bass and Herson 1993a). Mitigation measures are usually identified at the EA/Initial Study phase and the EIS/EIR phase. To be adequate and effective, mitigation measures should fit under one of five categories, defined by the CEQ as:

- **Avoiding** the impact by not taking certain action or parts of an action
- **Minimizing** the impact by limiting the degree or magnitude of the action and its implementation
- **Rectifying** the impact by repairing, rehabilitating, or restoring the affected environment
- **Reducing** or eliminating the impact over time by preservation and maintenance during the life of the action
- **Compensating** for the impact by replacing or providing substitute resources or environments

Evaluations of NEPA documents, particularly EAs and Findings of No Significan Impact, have revealed a large percent with either no mitigation or inadequate measures. Examples of poorly worded measures were: "Consult with...," "Study further...," "Prepare a plan...," "Strive to protect...," "Monitor the problem...," or "Submit for review..." The best test to determine the adequacy of a recommended mitigation measure is suggested to be, "*Is this measure a specific, tangible action that will reduce a physical environmental effect?*" (Bass and Herson 1993a).

An EIS or EIR must identify all relevant, reasonable mitigation measures that could improve the project. CEQA requires that "each public agency shall mitigate or avoid the significant effects on the environment of projects it approves or carries out whenever it is feasible to do so." In addition, the probability of the mitigation measures being implemented must be discussed under CEQA.

■ Neither NEPA nor CEQA require the agency to deny a project with significant adverse environmental impacts, nor do the proposed mitigation measures have to be adopted.

However, a federal agency does not have to adopt mitigation measures included in an EIS unless agency-specific NEPA procedures require adoption of mitigation measures or the agency commits to implementing mitigation measures in the Record of Decision. Similarly, CEQA does not require decision-makers to deny a project with significant adverse environmental impacts. The decision-making body must make a finding that approval is granted because of "overriding" social and economic benefit.

San Diego Bay Project Mitigation Measures

- Table 3-12 provides examples of the types of mitigation measures that were proposed for 10 Port and Navy projects on the Bay in recent years.

Mitigation measures have been prescribed for identified project impacts in San Diego Bay for many years. A review was made of five CEQA and five NEPA documents prepared for projects by the Port and the Navy since 1992 (see list below table). The proposed mitigation measures found within are summarized in Table 3-12. These mitigations, however, may not be the only ones that occurred or were required as conditions of permit approvals. For example, avoidance of impact through project redesign or other means may have occurred at an earlier phase. If mitigation is not listed, it also does not mean that the impact does not need mitigation. The main purpose of the table is to offer examples of the types of mitigation that have been proposed for various environmental impacts related to Bay projects in these documents.

Table 3-12. Examples of Marine Impact Mitigations Described for Recent Bay Projects (Based on EIRs, EISs, and EAs)[1].

Impact Caused by	Resource(s) Impacted	Mitigations Listed in NEPA/CEQA Documents	Projects [1]
Construction of shoreline facilities: activity, traffic, noise, lighting	Bird roosting, foraging, nesting	Construction during nonbreeding season (night heron). Removal of nesting tree during nonbreeding season. Construction of suitable nesting platforms before nesting season. Alternative replacement site established. Planting of new roosting and nesting trees at replacement site. Heron nesting management plan developed. Monitoring to determine success of replacement colony. Temporary sound walls near nest sites. Shielding of lights, education of workers about minimizing activity and noise near active nests. Impact considered insignificant and not cumulative with other projects.	Navy 1995 Navy P-144 Port 1994
	Bird survival—decreased by predation	Reduce perches and activities that attract predators. Monitor predation for 5 years and potential reduction program.	Port 1994
Cumulative impacts	Biological resources —general	Large-scale biological enhancement and protection planning. None proposed.	Port 1994 Port 1993c
Dikes	Habitat and biota loss	Beneficial effect. Replacement habitat of rocks provides greater diversity of organisms than soft-bottom habitat of Bay due to greater microhabitats. Engineering monitoring program to evaluate the structural integrity of rock dike throughout its lifetime.	Navy 1995
Dredging	Bay circulation	Model simulations to evaluate % changes.	Navy 1995
	Bird foraging and nesting	Minimize extent of dredge plume in high value tern foraging sites; coordinate schedule with other dredging projects; monitor turbidity (see Water Quality below); use of silt curtains; consultation with USFWS if plume persists. Minimize dredging during least tern breeding season. Eelgrass mitigation program will contribute to minimizing impacts. Use clean fill from mitigation site to enhance tern and plover nesting sites at nearby location during nonbreeding season. Loss of deepwater habitat compensated by increase in shallow water habitat and pier structures that attract fish.	Navy 1995 Navy P-144 Port 1993a, b
	Habitat and biota loss	Natural recolonization by macroinvertebrates and mobile biota. Mark and avoid areas of eelgrass. Creation of new habitat (ratio not specified). Offsite replacement of eelgrass habitat (using dredge material) at 1.2:1. Deepwater dredging: kelp avoided, dredge material used for beach replenishment, no mitigation for biota loss required/proposed.	Navy 1995 Navy P-187 Port 1993a,b
	Marine mammals and sea turtles	Natural relocation. If injured, halt action and consult NMFS. Take to treatment center. Weekly trawling prior to dredging to remove any green sea turtles from channel.	Navy 1995 Navy P-332 Port 1993b
	Water quality	Compliance with water quality monitoring program and dredge permit requirements; if criteria not met, interrupt operations and modify to attain compliance. Removal and or/containment of contaminated sediments. Use of silt curtain at discharge point. Dredge areas with highest levels of contamination first. Monitor to determine if all contaminated sediment is removed/not leaking out from sand cap.	Navy 1995 Navy P-332 Port 1993a, b Port 1994
Fill	Habitat loss	Construction of new intertidal and shallow subtidal areas from existing deeper subtidal habitat. Revegetation of eelgrass at 1.2:1 acreage by transplanting from donor beds. Addition of rock structures to retain fill and to enhance complexity and biodiversity. Offsite marine habitat enhancement. Area considered too small to be significant. None proposed.	Navy 1993, 1995 Port 1993a, c

Table 3-12. Examples of Marine Impact Mitigations Described for Recent Bay Projects (Based on EIRs, EISs, and EAs)[1]. (Continued)

Impact Caused by	Resource(s) Impacted	Mitigations Listed in NEPA/CEQA Documents	Projects [1]
	Biota loss	Assume benthic biota will migrate into new mitigation site. Environmental enhancement offsite. Avoid construction during fish spawning or prevent spawning by placing barriers across mouth of lagoon or creek. None proposed.	Navy 1993 Port 1993a, c
	Bioaccumulation of toxins (from effluent discharge)	NPDES Permitting process will define specific control requirements that would reduce the potential for bioaccumulation.	Navy 1993
	Bird foraging	Restoration/enhancement of eelgrass beds at 1:1. Environmental enhancement offsite.	Port 1993a Navy 1993
	Species composition change	Adhere to USACE guidance for inclusion of sediment samples out to a water depth of 30 ft (9.2 m) to establish dredge sediment compatibility with that of placement site.	Navy 1993
	Stress from turbidity on infauna, epifauna, intertidal benthos, fish, eelgrass	Methods to minimize turbidity effects to be evaluated and implemented. Located effluent discharge away from eelgrass areas.	Navy 1993
	Water quality	Use of silt curtain.	Port 1993a
Piers, docks, wharves: harassment, increased human activity	Bird foraging, nesting, roosting	Floating barriers to prevent access to sensitive areas. Public education, signs, buoys, use restrictions, and patrol to mitigate. Monitoring to determine if measures successful not addressed.	Port 1993c Port 1994
	Wave erosion of shoreline	Signs and buoys to limit approach and boater speed.	Port 1994
Piers, docks, wharves: boat sewage, trash	Water quality, marine organisms	Trash containers and sewage holding tank at marina, education by marina operator.	Port 1994
Piers, docks, wharves: pile driving	Marine organisms	Avoid least tern nesting season due to noise impacts.	Navy P-144
Piers, docks, wharves: shading	Habitat loss	Off-site marine habitat enhancement. 1.2:1 replacement of eelgrass.	Port 1993c Navy P-144
Roadways and bridges	Habitat loss: sensitive species, wetland disturbance	Contractor education program; certain prohibited activities within wetlands; vehicles use existing access roads to degree feasible; no staging areas within sensitive habitat area; minimize erosion and siltation; no-fueling zones; schedule construction to minimize biological impacts; site restoration plan prepared and implemented; spring surveys of sensitive species; species mitigation plan with USFWS consultation; wetland mitigation plan at 1:1 replacement for temporary impacts and 2:1 for permanent impacts; biological monitor onsite during construction.	Port 1997
Sediment disturbance	Water quality and food web; water column benthic biota	Water quality monitoring program, including mussel watch station and tissue analysis of resident burrowing organisms. Encapsulation of toxic sediments on site.	Navy 1995
Ship and boat mooring and maintenance	Water quality and food web	Testing and use of more environmentally friendly antifouling paint coatings proposed.	Navy 1995
Stormwater runoff	Water quality and food web	Monitoring of outfalls. Compliance with National Pollutant Discharge Elimination System.	Navy 1995 Port 1994

1. SDUPD. 1993a. Convair Lagoon Remediation. EIR/Remedial Action Plan. Prepared by Ogden Environmental and Energy Services, San Diego, CA.
SDUPD. 1993b. SDG&E Intake Channel Dredging, Chula Vista Bayfront. Final Negative Declaration.
SDUPD. 1993c. Shelter Island Plan Amendment, Driscoll Boatyard Expansion Project. Final EIR. Prepared by Decision Systems, La Mesa, CA.
SDUPD. 1994. National City Marina Project and Port Master Plan Amendment. Final EIR. Prepared by RECON, San Diego, CA.
SDUPD. 1997. Chula Vista Business Park expansion and Port Master Plan Amendment. Final EIR. Prepared by KEA Environmental, San Diego, CA. @ 350 p.
US Navy. 199?. Dredging at Pier 2 at Naval Station in San Diego. NAVFACENGCOM
US Navy. 1992. Small Craft Berthing Pier (P-187)
US Navy. 1993. Dredged Material Disposal. Draft EIS. Prepared by the Southwestern Division of the Navy, San Diego, CA.
US Navy. 1995. Final EIS for the development of facilities in San Diego/Coronado to support the homeporting of one Nimitz Class aircraft carrier.
US Navy. 1998. Project P-144 at Coronado. (Ongoing)

Part III: Management Strategies